COMMERCIAL FISHERIES Review

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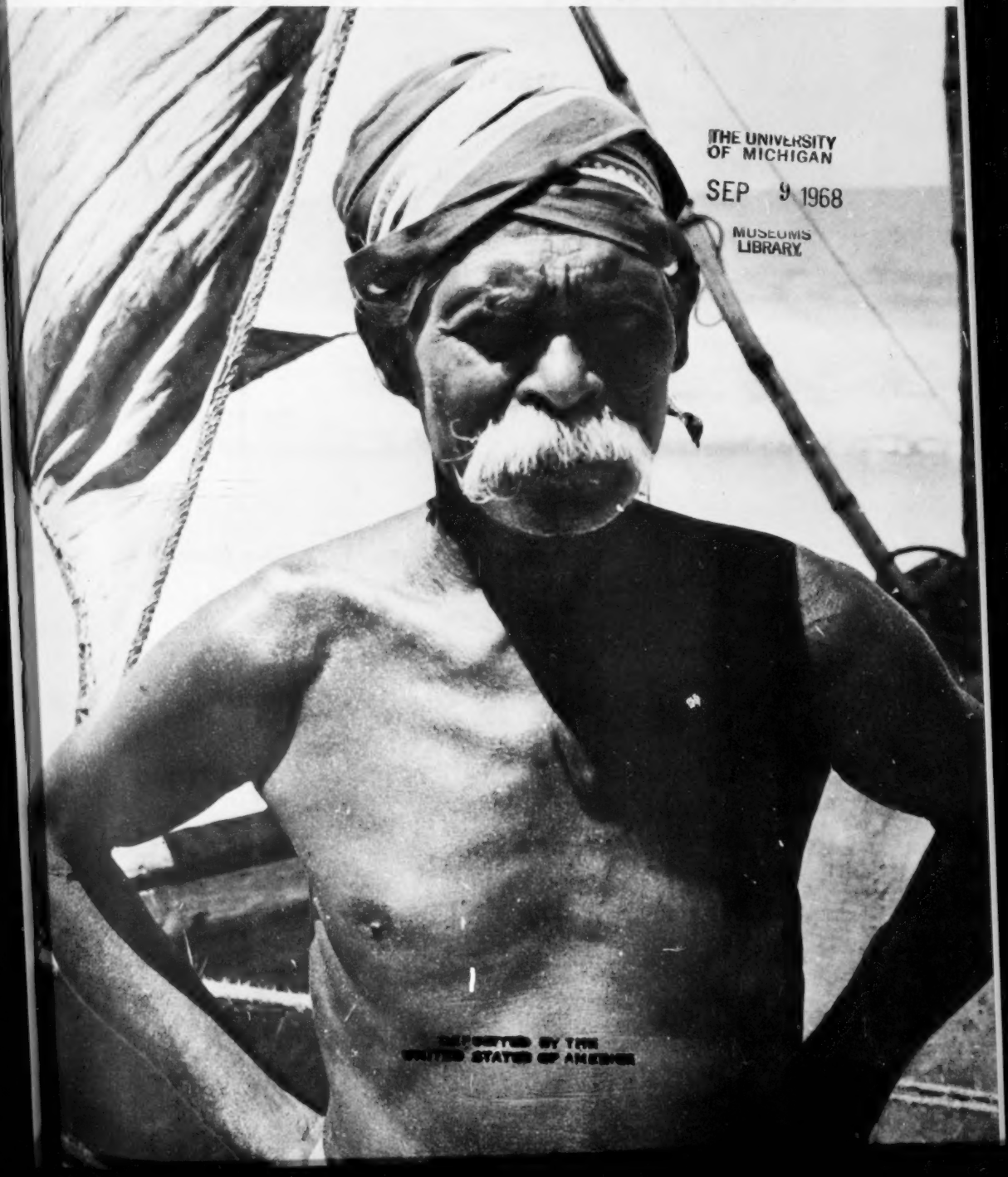

COVER: Fisherman of Ceylon. (Photo: FAO/Alan Glanville)

COMMERCIAL FISHERIES

Review

A comprehensive view of United States and foreign fishing industries--including catch, processing, marketing, research, and legislation--prepared by the Bureau of Commercial Fisheries.

Fishermen's Memorial
Gloucester, Mass.

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Throughout this book, the initials BCF stand for the Bureau of Commercial Fisheries.

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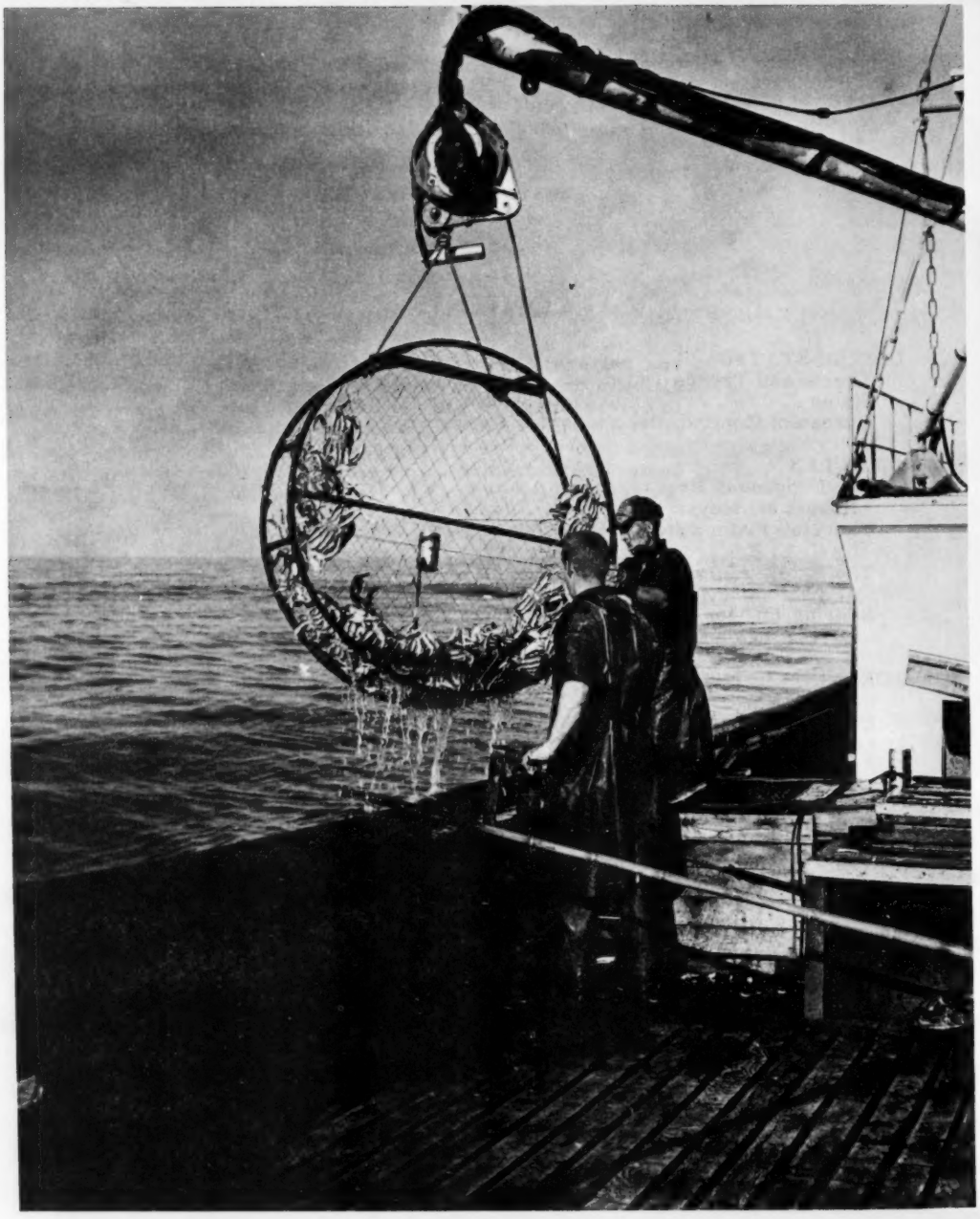


Fishermen guide dungeness crab pot (60-inch diameter) being lowered by boom to power barge. See Article p. 44.
(Robert M. Meyer)

HUMPHREY PROPOSES NATIONS DEVELOP LEGAL PRINCIPLES FOR OCEAN-FLOOR ACTIVITY

Vice President Humphrey has proposed that the nations of the world seek early agreement on legal principles to guide their activities in exploring and using the deep-ocean floor. His proposal was read on June 24 at the opening of the Third Conference of the Law of the Sea Institute of the University of Rhode Island at Kingston, R. I.

The Vice President is Chairman of the National Council on Marine Resources and Engineering Development, better known as the Marine Sciences Council.

He noted that a United Nations ad hoc Committee is considering such legal principles. The U. S. view is that an internationally accepted, precise boundary of the deep-ocean floor be outlined as soon as feasible. It should take into account the Geneva Convention on the Continental Shelf. This boundary can be drawn even before there is international agreement on the general principles applicable to the deep-ocean floor.

What Agreements Should Cover

The Vice President stated that arrangements on exploiting the deep-ocean floor should include provisions for:

"the orderly development of resources of the deep ocean floor in a manner reflecting the interest of the world community in the development of these resources;

conditions conducive to the making of investments necessary for the exploration and exploitation of resources of the deep ocean floor;

dedication as feasible and practicable of a portion of the value of the resources recovered from the deep ocean floor to world or regional community purposes; and

accommodation among the commercial and other uses of the deep ocean floor and marine environment."

Marine Sciences Council

The Marine Sciences Council was set up 2 years ago by the Marine Resources and Engineering Development Act of 1966. The Council is composed of the Vice President, 5 Cabinet members, and 3 heads of other Federal agencies. It advises and assists the President in policy planning and coordination of the marine science programs of 11 Federal agencies.

THE U.S. FISHING INDUSTRY

Seattle Conference Charts Course to Guide Industry Out of Doldrums

A committee representing the 266 participants in "The Conference on the Future of the United States Fishing Industry," held in Seattle, Wash., March 25-27, has issued a conference report that puts first things first.

The report states: "The major conclusion to be drawn from the Conference is that the principal immediate problems are in the domestic fishery. Processing, retailing and distributing sections are in general doing well primarily because of the increasing population of consumers. Their primary problem is expansion to obtain a larger share of the rapidly growing food market."

The Conference was sponsored by the University of Washington College of Fisheries, BCF, the National Council on Marine Resources and Engineering Development, and private industry.

The report discusses the causes of stagnation in the fishing industry, outlines industry's probable development in the years ahead, and recommends ways to develop a stronger industry.

It recommends 4 major changes that "can do much to rectify the existing situation":

- Government policy should be shifted "from the predominate emphasis on the protective aspects of conservation to a positive policy of developing fisheries and an economically healthy seafood industry."

- The seafood industry as a whole should recognize that "its future depends upon a healthy, domestic fishery which can profitably harvest the underutilized stocks of fish off the U. S. coast."

- Sections of the seafood industry should develop "a more unified viewpoint" in their relationship with public and Government.

- The fish industry should identify itself more closely as a part of the food industry.

THE DOLDRUMS

Before the conference convened, Dr. Richard Van Cleve, Dean of the College of Fisheries, explained the "stagnation" of the U. S. fishing industry. He said:

"By 1966 the annual total world production of fish had increased from about 40 billion pounds in 1948 to more than 115 billion pounds. The U. S. fishing industry, however, did not keep pace with this growth, and over the last 30 years production of fish in the U. S. has remained almost constant at between 4 and 5 billion pounds per year.

"This has been particularly surprising, since the consumption of fish and fish products in the U. S. has been expanding at about the same rate as world production. By 1966 annual consumption had grown to 12.4 billion pounds, an increase of about 9 percent a year since 1958."

This gap between U. S. fish production and consumption was so wide, Dr. Van Cleve noted, that in 1966 the U. S. imported over 65 percent of the fish and fish products used.

THE FISHING INDUSTRY

The many-faceted fishing industry harvests fish on all U. S. sea coasts and the larger fresh waters and sells its catch throughout the U. S. It uses many methods to harvest dozen of fish species and makes many products. The problems of Maine fishermen differ from the California fishermen's. And, in many ways, the fishermen's problems differ from those of processors or distributors.

While conference participants differed in the emphasis they put on industry problems, "there was general agreement on the need for an economically healthy fishing industry which would contribute substantially to the domestic economy."

The U. S. fisherman cannot meet profitably the domestic demand for many seafood

products. So the processing and distribution sections of the industry depend more on imported raw materials and finished seafood products. Of course, this hurts the fisherman. The committee report strikes a warning: The supply of some foreign-caught fish will be reduced greatly in the future as demand for this fish increases abroad. "This could be economically disastrous for the processors and retailers who have become dependent on imported fish."

There is irony in the U. S. situation. The U. S. has large stocks of fish off her coasts, her fishermen can operate any kind of equipment anywhere in the world, and she is the world's largest market for fish products.

The report answers 2 very important questions: Why do so many fishermen fail to make money? Why in the past 30 years has the U. S. shifted from producing practically all of her fish to importing over two-thirds?

Many U. S. fishermen are caught in a squeeze: the prices they receive are held down by other protein foods and by imported fish--but their production costs are rising. "Not only are many U. S. producers in trouble, but their problems are expected to become worse unless strong remedial measures are taken."

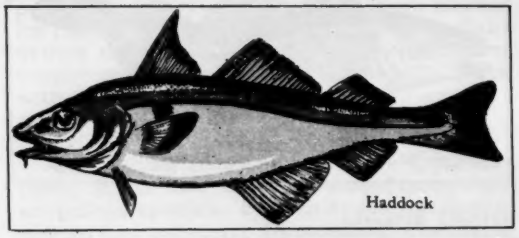
MAJOR CAUSES OF FISHERMAN'S PLIGHT

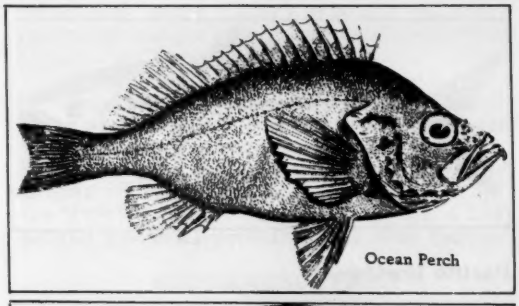
The report sets forth 3 major causes of the fisherman's plight:

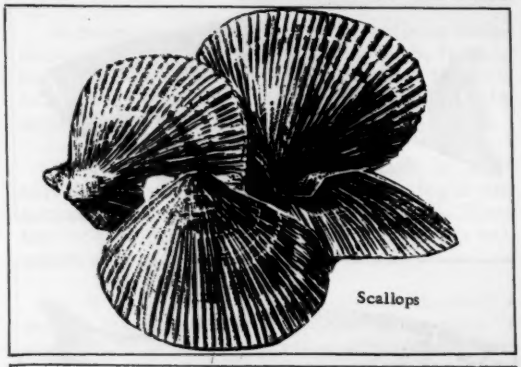
- There are too many boats and fishermen in the traditional fisheries--and the catch has leveled off. These fisheries attracted fishermen and investors when catches were rising, but when the harvest limit was reached the fisheries became unprofitable. "When government has stepped in to save the resource it usually has regulated the fishermen to make them less efficient."

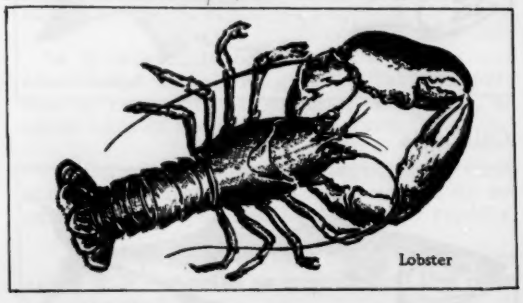
"Most of our well-known natural stocks of fish are near the sustainable limit of production." The list includes in --

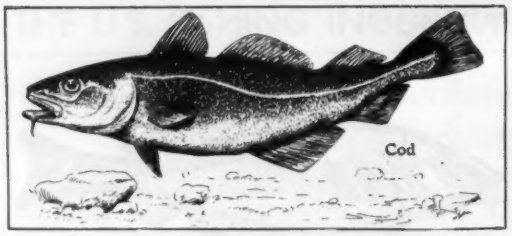
New England


Haddock

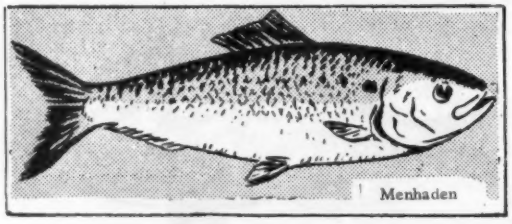

Ocean Perch


Scallops

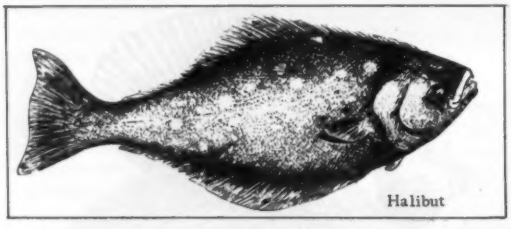

Lobster

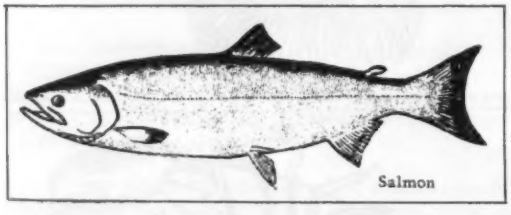


Middle Atlantic



Pacific Northwest





California

"Few, if any, of these stocks will yield more sustainable catch no matter how hard they are fished."

In all these fisheries, there is "too little return on capital invested and too many fishermen making too little money." A solution to this problem will come when the fisherman and the investor are rewarded as much as labor and the investor in the U. S. economy as a whole. This cannot be achieved "as long as everyone who chooses is permitted to enter these fisheries."

- Many State and Federal restrictions prevent development of new fisheries--for example, of Alaska herring, California anchovy, and Gulf of Mexico threadfin herring.

- Confusion is produced by the separate jurisdiction of States and the "lack of effective coordination" of management or investigation across State lines. Added to this is the 12-mile fisheries limit recently claimed by the U. S., which creates a limbo of authority or action between the 3-mile territorial limit and the 12-mile limit.

FUTURE HOLDS SOME PROMISE

Despite the many problems of the fishing industry, the report states that the "future is promising for using underutilized species." U. S. fishermen could increase their catch off U. S. coasts at least tenfold. They can do it more economically than a foreign fleet that has to come thousands of miles. At present, because the public does not know most of these stocks, the fishes have no "market identity."

Most of these stocks are not in the areas of the traditional stocks. They "require different fishing gear, different handling methods, and different processing methods." But all these stocks are nutritionally equal to the traditional species and many are comparable in taste appeal. If these stocks were fished, they could supply the rapidly growing market for high-quality protein foods.

"The largest marketing opportunities in terms of volume are in the production of fish meal, fish protein concentrate (FPC), and frozen fish blocks."

There are large, growing U. S. markets for fish meal and frozen blocks, now dependent largely on imports, and both can be made

Fig. 1 - Fish meal.

Fig. 2 - FPC.

Fig. 3 - Frozen fish blocks.

from many species. FPC "is expected to offer a major market in the near future." The pet food industry offers another large market for fish. The report emphasizes: "Our fishermen can reach these markets only if they supply raw materials at a price competitive with that of other suppliers of plant and animal protein."

The fishing industry has other opportunities. It can increase the catch of many higher-prices species: certain crabs, mollusks, and northern shrimp. By modifing processing techniques, more fishery products can enter the burgeoning convenience-food market at higher retail prices.

While the Seattle conference did not consider aquaculture at length, the report states: "It offers many opportunities for the production and sale of high-priced fishery products. It does not seem to offer a significant promise anywhere in the U. S. to produce low-priced animal protein in the near future."

RECOMMENDATIONS

In recommending the 4 major actions listed above to correct problems in the U. S. fishing industry, the committee emphasized that the following "precepts and principles" must be applied:

- A large part of the fishing fleet is "relatively efficient within the existing legal and economic restraints on the fisheries." When the restraints are lifted, the fishermen will adopt new methods and equipment.

- It is technically feasible to develop a strong fishing industry that can supply "a significantly larger portion of the fish consumed in the U. S."

- It is feasible to use the sea's resources more fully--and also to give "suitable priorities to recreational, esthetic, scientific, or other uses of the living resources."

- Effective ways of managing most U. S. and foreign fisheries in U. S. waters do not exist. The ways must be developed rapidly.

- The present divided authority in managing U. S. fisheries is impractical and must be corrected.

- Fishery regulations should be designed to encourage rather than discourage fishing efficiency.

• The industry's continuing deterioration or greater dependence on imports is not in the best interests of the U. S.

Based on the above fundamentals, the report recommends to all concerned:

• Consider jointly, because they are interdependent, development of the ocean's potential to help solve world food shortages and development of a strong U. S. industry. Government should help.

• Areas of authority in managing resources must be defined better. This would permit effective use of scientific management knowledge--and development of research to investigate condition of fish and shellfish stocks.

• Consider the "limited entry concept of management . . .to improve efficiency of harvesting living resources with adequate safeguards to avoid monopoly."

• Government at all levels should eliminate restrictions based on cutting the fisherman's efficiency.

• Remove unwarranted restrictions on marketing fishery products: for example, the requirement that FPC be marketed in 1-pound packages. The U. S. must strengthen its policy on the rational use of living resources of the high seas.

• Government aid must be directed mainly toward encouraging use of underutilized stocks--and evolution of effective fishing and processing systems for existing fisheries.

• Government should identify and then help when production of existing fisheries can be raised by developmental work. One example is hatchery production of coho salmon a sound economic basis by Columbia River hatcheries.

• Government, industry, and universities should develop data to permit evaluation of the fishing industry's status. One study should compare costs from producer to consumer in the U. S. and abroad.

• Industry should develop and expand the market for seafood items by insuring high quality "through quality control of raw material, production, and distribution by the industry." Government inspection systems should be designed. The fishing industry should operate as part of the food industry and so benefit from the latter's marketing and sales-promotion techniques.

Committee Offers Some New Ideas

In summary, the committee states that its recommendations differ from most made previously. They stress the need for a more postive U. S. policy toward developing the fishing industry; encourage improvement of efficiency in fishing fully utilized stocks; emphasize the development of underutilized stocks; suggest change in Government responsibility for managing fisheries; propose industry action to improve its position in the U. S. food market.

If industry, universities, and Government carry out these proposals, the committee states, the seafood industry would be able to react to opportunities to develop resources off U. S. coasts, adopt technological innovations, and make itself strong.

The report concludes: "Major problems confronting our industry can be resolved by a cooperative approach of industry, the academic community, and government, but their resolution will depend strongly on government policy and attitude towards domestic fisheries."

Dr. Donald Bevan, associate dean of the College of Fisheries, was chairman of the report committee. Other members representing the University, Government, and industry were: Dayton L. Alverson, Rovert L. Burguer, James A. Crutchfield, Brewster Denny, John B. Glude, Donald R. Johnson, Ralph W. Johnson, John Liston, Marion E. Marts, George Pigott, William F. Royce, Sigfryed Jaeger, and Harold Lokken.

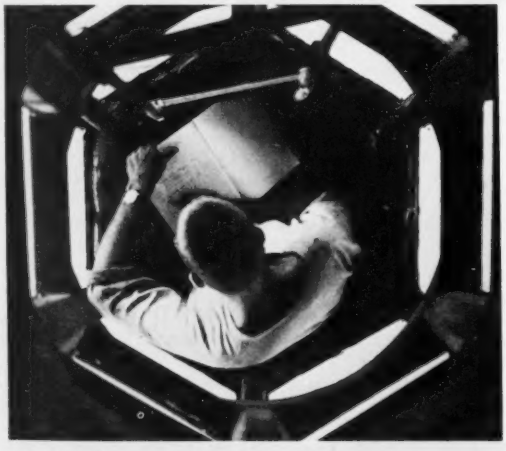
UNITED STATES

Ford Foundation Aids Science of Ecology

The Ford Foundation has granted $3,964,550 to 7 universities to advance the science of ecology. Ecology deals with the interrelations of living things with each other and with their common environment. Today there is a shortage of ecologists and the foundation's action seeks to improve the situation.

The 7 universities are Yale, Johns Hopkins, the University of Washington, British Columbia, Missouri Botanical Gardens (affiliated with Washington University), University of California, Davis Campus, and Colorado State University.

In 1967, the foundation gave the University of Chicago $1,036,000 and Princeton $372,000 to expand programs in ecology. Five of the 7 new grants are for the same purpose.



Vehicle to study ocean's upper layers. Biologist Reginald Gooding in observation chamber of raft "Nenue" of BCF's Biological Laboratory in Honolulu.

Gooding designed and built it to study fishes that accumulate under floating objects at sea. View chamber extends 7 ft. under water. In cramped quarters, biologists view and photograph many creatures. (Photo: J. J. Magnuson)

Avoid Unplanned Exploitation

The chief of the foundation's natural resources and environment program, Gordon Harrison, made clear that the organization did not seek to stop or even slow mankind's exploitation of environments. It did want to help man exploit wisely--and so avoid the disastrous results of unplanned exploitation.

Harrison said industry creates civilizations, but industrial exploitation has polluted man's environment. He noted that inorganic fertilizers increase crop yields--but deplete the soil. And new fishing techniques greatly increase the catch--but encourage overfishing. This, Harrison added, threatens the survival of food fishes on which people and large industries depend.

Population Boom

To these problems, Harrison emphasized, add the population explosion.

"The precipitous increase in human population has begun all over the world to put unprecedented demands on natural resources to feed and clothe the multiplying generations, to absorb wastes of industrial and life processes, and to provide living environments conducive to human well-being," he said.

"Some of the first consequences of these population pressures are already critical and highly visible--inadequate food supply in the less developed nations, pollution in developed areas."

Governments apply technological remedies that work for a time. But they can have "consequences in the longer run that precipitate other crises, unless ecology and related sciences produce the solutions."

Fishery Rights and the Law of the Sea

A Summary of Our Fishing Rights and Obligations on the High Seas

By John Radovich*

The appearance of the Soviet fishing fleet off California's coast in 1967 has aroused the emotions of at least a portion of California's commercial and recreational fishermen. Some are saying, "We told you they were coming," and others were asking, "Why doesn't the U.S. Navy or Coast Guard or someone chase them away? What right do they have off our coast, exploiting our stocks of fish and competing with our fishermen?"

The answer is, "They have a legal right to fish off California's coast provided they fish at least 12 miles offshore."

Under international law, the high seas are not subject to the jurisdiction of individual countries. They are free for the use of all. However, there are rules and procedures by which fish may be protected from over-exploitation.

Up to 1958, a body of international law of the sea had developed through the common practice of nations, the unilateral proclamations of some and the bilateral or multilateral treaties among others. In an effort to codify existing law into treaty form, resolve existing issues, and establish some international system for protecting and conserving the living resources of the sea, the United Nations sponsored a Law of the Sea conference in Geneva, Switzerland, in 1958.

There were 86 nations present at this conference, and they hammered out four different conventions, or agreements, which have, to different degrees, gained a measure of stature as international law.

The four conventions were the "Convention on Fishing and Conservation of the Living Resources of the High Seas," the "Convention on the Territorial Sea and the Contiguous Zone," the "Convention on the Continental Shelf," and the "Convention on the High Seas." These four conventions, or agreements, laid the basis for determining the rights and duties of nations on the oceans and in the conservation of the living resources of the sea. To the extent that these conventions codify existing principles of international law, they are, of course, binding on all nations.

Conservation of the Living Resources of the High Seas

The Convention on Fishing and Conservation of the Living Resources of the High Seas was the first to develop an international code for the conservation of fisheries.

This convention provides, among other things, that the coastal state has a special interest in maintaining the productivity of the living resources in any area of the high seas adjacent to its territorial sea. The coastal nation also has the duty to enter into negotiations with nations fishing for these resources and the other nations in turn are obligated to negotiate in order to develop conservation measures.

If, after negotiating for six months, an agreement hasn't been reached, the coastal nation may unilaterally adopt conservation measures to protect and conserve the resources. The measures adopted by the coastal nation cannot discriminate against a distant fishing nation, and must be based on sound scientific findings. For example, the total harvest of a resource could be regulated, but the other country or countries involved still would be entitled to a share in the harvest.

Should these measures be disputed by the fishing nation, then the matter is referred to a special commission of five members for resolution.

The convention further defines conservation as measures resulting in the optimum sustainable yield to secure a maximum supply of food and other marine products.

This convention has not been ratified by the Soviet Union because of its views on the compulsory settlement of disputes as contained in the convention.

*Chief, Marine Resources Branch, California Department of Fish and Game.
Reprinted from "Outdoor California," May/June 1968.

Consequently, the terms of the convention are not binding on the Soviets. However, they have been willing to negotiate fisheries agreements under the substantive terms of the convention.

Convention on the High Seas

The convention on the high seas established four freedoms which had been commonly practiced prior to the convention: freedom of navigation, freedom of fishing, freedom to lay submarine cables and pipelines, and freedom to fly over the high seas. These freedoms apply to both coastal and noncoastal nations.

Convention on the Territorial Sea and the Contiguous Zone

The convention on the territorial sea and the contiguous zone sets out criteria by which nations can measure their territorial seas, sets down rules governing the innocent passage of ships through the territorial sea of a coastal nation, and defines the contiguous zone of a country's territorial sea as extending beyond the territorial sea but not more than 12 miles seaward from the baseline from which the territorial sea is measured.

Within this contiguous zone, the coastal nation may exercise control necessary to prevent infringement of its customs, fiscal, immigration, or sanitary regulations, and may punish infringement of these regulations committed within its territory or territorial sea. The width of the territorial sea was not defined.

The Continental Shelf

The convention on the continental shelf establishes the sovereign right of coastal nations to explore and exploit certain natural resources. The resources involved include mineral and other nonliving resources of the seabed and subsoil, and sedentary living organisms such as crab, which, at the harvestable stage, are unable to move except in physical contact with the seabed. The convention does not apply to the free swimming fishes, nor to the waters, above the continental shelf.

The continental shelf is defined as the seabed adjacent to the coast outside the territorial sea to a depth of 200 meters, or beyond that limit to the extent of the exploitability of natural resources. This brings into focus the need for a rapid expansion and increased competence in ocean engineering, technology, and science, if the United States is to take advantage of the vast resources available to it under the terms of the convention on the continental shelf.

However, since the test of exploitability for expanding the outer boundary of the continental shelf is an objective rather than a subjective one, the technology for developing marine resources of the continental shelf does not necessarily have to be that of the United States. All nations' continental shelves are extended in accordance with the most advanced technology. Prevailing thought is that the deep sea bed may not be subject to this convention.

Territorial Sea and Exclusive Fishing Zone

The Geneva Convention failed to adopt definitions of the territorial sea and an exclusive fishing zone in 1958. A second Geneva Convention was held in 1960 where one proposal of many failed by one vote of having the necessary $\frac{2}{3}$ vote for passage. This measure, proposed by the United States and Canada, defined a six-mile territorial sea and another adjacent six miles (total of 12) as an exclusive fishing zone for the coastal nation.

Since 1960, well over half of the coastal nations represented at the Geneva Conventions have established exclusive fishing zones of 12 miles. The United States took this step in 1966, and now has a territorial sea of three miles and an exclusive fishing zone of nine more miles (total of 12 miles).

Because of the general support for the 12-mile contiguous fisheries zone and because of the relative absence of protest from the leading maritime nations of the world to the unilateral acts proclaiming such zones, it is likely that these claims will ripen into international law at some point in the future and will, in the interim, not be held to violate present international law.

However, since some countries are claiming territorial seas or contiguous fishing zones of up to 200 miles, continued difficulties are anticipated between nations until these conflicts are resolved. The United States does not recognize any claim for an exclusive fishing zone beyond 12 miles.

The Russians

The Russian fishing vessels which first appeared off the coast of California in 1966 and have been fishing farther than 12 miles off our coast have a legal right to do so. And even though the United States has approved

all four conventions and the Russians only three, Russia still has observed the terms of the fourth convention, the conservation of the living resources of the high seas, and has displayed a willingness to negotiate with the United States for the conservation of species under the terms of this convention.

U. S. Food Fish Stocks at Midyear About Same As in Mid-1967

On July 1, total U. S. cold-storage holdings of food fish were about the same as a year earlier. But individual commodities revealed differences.

Stocks of fillets and steaks of every species, except pollock and flounders, were down from July 1, 1967. Total stocks were nearly 8 million pounds lower. Stocks of ocean perch were more nearly normal (last year's holdings were high.)

New England groundfish production was down but imports have kept prices stable.

On the other hand, stocks of fish blocks were up nearly 8 million pounds, and fish sticks and portions up 3½ million pounds. Foreign fish-block producers will need to shift more of their production from fish blocks to packaged fish fillets to keep the prices of the 2 markets in line with each other.

Pacific Halibut

On July 1, total U. S. stocks of Pacific halibut were down 4½ million pounds from a year earlier.

On June 1, Canadian holdings of halibut were up because the 1967 strike there delayed the halibut season. The season is below expectations in landings and prices.

Because U. S. stocks were down and the season will close this fall with lower-than-expected catch, higher halibut prices will be needed to ration the available Canadian and U. S. stocks through the winter until the new season starts in May 1969.

Low Sockeye Run

This is the second year in a row that the major run of red, or sockeye, salmon in Alaska is very low. The rest of the salmon season needs to be watched closely this summer to determine quickly the price level necessary to move the new canned salmon pack evenly through June 1969. By September, nearly all the pack will be in.

Shellfish

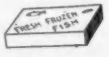
Shellfish stocks were down more than 3 million pounds from a year earlier. Every shellfish item except raw shrimp was down. The drop in breaded and other forms of shrimp was enough to bring total stocks of shrimp down slightly.

A normal shrimp-production season in the Southern States is expected this year.

Scallops

Scallop production on the Atlantic coast was low for both Canadian and U. S. fishermen--and prices were high.

The new scallop fishery of Alaska must be followed closely to determine its size--and to maintain a price level that will keep consumption in line with available supplies. (BCF Branch of Current Economic Analysis)



Value of Imports Is Up From Year Ago

U. S. imports of edible fishery products during January-May 1968 were worth $241 million--19% above the 1967 period. This was reported in the July 15, 1968, issue of "International Commerce," published by the Bureau of International Commerce.

Imports of meat and meat preparations during January-May 1968 increased 15% over the 1967 period.

Predicts More Imports

The Bureau of International Commerce predicts: "Both meat and fish purchases will be greater than last year. Higher U. S. prices and less vigorous demand in other major importing regions have contributed to the rise in meat arrivals so far in 1968. Imports of fish will reverse their 1967 decline largely because of improved prices and inadequate inventories."

Pacific Halibut Landings Are Below Normal

In 1968, Pacific halibut landings by U. S. and Canadian vessels are expected to be about 58-59 million pounds. The 1968 quota is 58.5 million pounds. In 1965 and 1966, landings surpassed the quota by 4-5 percent; in 1967, landings were 7 percent short of the quota.

In 1968, only about 27-28 million pounds will be caught by U. S. vessels. By May 31, the U. S. share was only 41 percent of total landings. Last year, fishing for Pacific halibut was hampered by a prolonged Canadian fleet strike and lower prices. No strike seems in the offing, but halibut prices continue low.

By July 1, landings were higher than a year ago but lower than preceding normal years. However, inventory is lower and consumption higher. The fishing effort of the U. S. and Canadian halibut fleets might be affected if the present low-price trend continues.

Fish Meal From TVA Shad & Carp Used in Broiler Growth Study

Fish meals made from shad and carp taken from lakes of the Tennessee Valley Authority (TVA) are equal to menhaden fish meal for broiler growth and feed efficiency. This was reported by University of Tennessee scientists. They also stated that carp fish meal is equal to menhaden fish meal in chick pigmentation properties.

The scientists conducted a 4-week growth study to determine the effects of several levels of fish meals prepared from TVA shad and carp on broiler growth, feed efficiency, and xanthophyll (natural yellow) pigmentation. They used 480 broiler-type cockerel chicks.

The Study

Each fish meal was added to the diet to supply fish protein equivalent to that supplied by 2, 4, 6, 8, and 16 percent of a high-quality menhaden meal. A diet containing no fish meal was fed as a negative control.

Results

The average body weight and feed efficiency of the chicks did not differ significantly between treatments. Skin pigmentation generally increased as fish-meal level in the diet increased. At the 2, 4, and 6-percent supplementation level, chicks fed diets containing shad fish meal were lighter in color than those fed diets with carp and menhaden fish meals. No evidence of thiamine deficiency was noted in any chicks. ("Feedstuffs," June 22.)

Shrimp Supply Rose 15.6% in 1967

The available U. S. shrimp supply in 1967 was 15.6% higher than in 1966 and 20.1% above 1965. Shrimp imports again set a record in 1967. They increased 4% above 1966 and 13.3% above 1965.

Lake Superior Sea Lampreys 86% Less Than In 5 Years Before Controls

The catch of adult lampreys at the 16 electrical barriers on U. S. streams tributary to Lake Superior was 7,936 this year. The catch was much above the level during the past 2 years--but below the average for all years since chemical control affected the lampreys.

In 1968, the lamprey population is 85% below the 5-year average before controls were used.

Panamanian Fishermen Grateful for BCF Gift of Haul Seine

Members of a fishermen's cooperative in the village of Montijo, Panama, short of nets, have received a farm-pond haul seine from BCF. They are grateful for it. The fishermen expect the gift to increase their catches up to 40 percent, according to newspaper reports. Many undernourished families in Veragus Province also will benefit.

The seine was released to the Peace Corps by BCF's Branch of Exploratory Fishing at Kelso, Arkansas.

Japanese Survey U. S. Household Use of Canned Tuna in Brine

The Japan External Trade Organization (JETRO) recently conducted a household survey in the U. S. to determine consumer response to canned tuna in brine. A total of 370 householders in Boston, New York, and Philadelphia were asked how many times a week they ate canned tuna. An average of 3 percent said it now uses canned tuna twice a week compared with once a week 2 years ago. The frequency of consumption rose more among the relatively heavy users.

Why They Eat It In Brine

Among householders eating canned tuna in brine, those who use more now than 2 years ago exceeded those who reported using less now. Reasons for increased consumption were: "for diet," "taste," "children's preference," etc. Among the lighter users a relatively high percentage said its consumption dropped because children's preference had changed.

The study of frequency of consumer shift between in-oil tuna and in-brine tuna revealed 38 percent switched frequently from one type to the other. Many of them switched because they "wanted to change," and a fairly large number was motivated by price.

52% Chooses Quality

Among users of Japanese canned tuna in brine, 52 percent said its choice was based on quality, and 9 percent said price. Users of Japanese brands in the 3 cities averaged 62 percent; this indicated majority of in-brine consumers prefers Japanese pack.

Fifty-one percent of respondents correctly identified Japanese pack, one percent mistook Japanese for a U. S. pack, and 56 percent correctly identified the origin of all brands.

Price A Factor

Thirty-eight percent of respondents said price was an important factor, while 62 percent denied it. In New York, 54 percent of users were motivated by price. The importance of price inducements varied with the city.

Brand Loyalty

Seventy-two percent of brand users said they would stay with brand regardless of price change. In New York, brand loyalty was stronger than in the other 2. Among canned tuna users, a large majority reported it would change brands if price moves 2-5 cents per can; hardly any said they would change for a price difference of less than 2 cents. However, among relatively heavy users, 11 percent said it would change brands even for one cent. This is noteworthy because price change would have greater effect on budget of large families that consume more canned tuna.

How Often Eaten

Among persons interviewed, about 20 percent were regular users of canned tuna in brine, 16 percent were occasional users, and 63 percent were nonusers. Of nonusers, only about 40 percent said they would prefer canned tuna in oil, and 38 percent were not aware of availability of canned tuna in brine. Of the 38 percent, 25 percent did not know such a product existed, and 13 percent has never tried it. ("Katsuo-maguro Tsushin," June 12 & 13.)

Translation of Soviet Fishery Journal

The American Fisheries Society has received an 18-month grant of nearly $25,000 from the National Science Society for a project entitled, "Translation of Journal, Problems of Ichthyology (1968 Volume)." The Society will translate, edit, print, promote, and distribute the 1968 volume of "Voprosy Ikhtiologii" (Problems of Ichthyology), a publication of the Academy of Sciences of the USSR.

The English-language edition will run to more than 800 pages per volume. The translation of the first 1968 issue of the journal was slated to be completed and distributed in July 1968. Subscriptions can be ordered for $48 per volume from the American Fisheries Society, 1040 Washington Bldg., Washington, D. C. 20005.

OCEANOGRAPHY

Scientists Hope to Solve Mystery of Deep Scattering Layer

One of the great mysteries of the ocean--deep scattering layers--has turned scientists of the U. S. Naval Oceanographic Office into detectives. These seagoing sleuths recently netted their "evidence," thousands of marine organisms, on a 7-day cruise north of Hawaii. The task is to analyze the evidence in the laboratory hoping that it will shed some light on the composition of the deep scattering layers.

The marine life caught on the Pacific cruise, the first of its kind undertaken in the Pacific by the Office, will be compared with specimens collected since July 1965 on similar operations in the Atlantic. This should help the scientists develop a worldwide view of the deep scattering layers, which were discovered by accident during World War II.

What Scattering Layers Are

Deep scattering layers are horizontal, sound-scattering, bands that exist at various depths, generally in the upper 3,000 feet, over broad reaches of the world's oceans. The bands often produce "false bottoms" on the recording traces of echo-sounding devices. Cartographers have charted nonexistent shoals because their sound equipment traced deep scattering layers instead of the actual sea bottom.

Scientists have learned that marine animals making up the deep scattering layers migrate to the surface at sunset and descend to mid-depths at sunrise. Now oceanographers must determine the types of marine life inhabiting the deep scattering layers. Although they believe the most important organisms in the layers are fish possessing swim bladders, which act as air bubbles to scatter sound waves, they have identified only a few. Fish known to inhabit the deep scattering layers are lantern fish, hatchet fish, and bristlemouths.

Fish Swim Bladder

A fish swim bladder is an excellent scatterer of sound energy. The frequency of the sound it scatters best, its resonant frequency, will vary--depending on the depth and diameter of the bubble. A small bubble has a higher frequency than a large one. Scientists know that the swim bladder expands and contracts as the fish migrate up and down the water column, but they do not fully understand its mechanisms.

Problems

The high mortality rate of the delicate animals has made the job of analyzing the gases contained in the swim bladders, and determining the oxygen needs of the fish, extremely difficult. The very act of catching the organisms, in nets lowered to as much as 360 fathoms, shocked the animals. They were either injured or killed as they thrashed against each other and against the nets. Rapid temperature change from the depth of capture to the surface also may have caused many organisms to die before landing.

Equipment

Thirty-six different collections or catches, with a 10-foot Isaacs-Kidd midwater trawl and a 6-foot Tucker net, were made during a 4-day stay at the study site, 240 miles north of Oahu. Biologists will identify the organisms and try to determine the depth at which they were caught--their vertical distribution in the water column. Catches with the Tucker net, which opens and closes at predetermined depths, will help the biologists determine vertical distribution. The Isaacs-Kidd trawl, an open net, caught marine life at all levels. A 4-chambered sampler, which can be electrically triggered to close at any depth to collect 4 separate samples, will be used on future trips.

Acoustic Measurement

At present, acoustic measurement of the layers is made with a "bomb" or a 2-pound charge of TNT, detonated at a predetermined depth by a pressure-activated device. Though "bombs" provide valuable information on sound scattering, they are not suitable for measuring individual layers. Experiments are being conducted with a pulse sounding system--a directional, downward-looking instrument similar to the echo-sounder used to chart the ocean floor. This system should permit detailed measurements of individual layers at several different frequencies. Both methods were used on the Pacific cruise, but the pulse system still needs development.

The "bombs" gave more valid information. Measurement techniques are continually improving, and the scientist hope they will be able to chart the layers--for the Navy and the marine community.

Gulf Stream Meanders Probed

Six oceanographers of the U. S. Naval Oceanographic Office are trying to answer a question this summer that puzzles ocean scientists: "Why does the Gulf Stream suddenly begin to wander aimlessly along its northern edge after flowing from Florida to Cape Cod on a fairly straight, well-defined path?" These meanders are deviations of the current's flow pattern.

During a combined ship-aircraft operation, the oceanographers are studying the structure and rate of change in the meanders along the Gulf Stream's northern boundary. The primary phenomena being investigated are "the volume of water transported by the meanders, the distribution of heat in the study area and the horizontal or vertical flow of sea water as it deviates from its flow pattern."

The Area

The scientists selected a 55,000-square-mile area about 200 miles south of Halifax, Nova Scotia. This area is broad enough to cover several branches of the meandering Gulf Stream. It was chosen because it is well east of Mt. Kelvin, the largest underwater mountain in the chain off New England.

The oceanographers reached their destination July 20 aboard the USNS "Lynch." An aircraft carrying other scientists was scheduled to make 6 flights over the area starting July 29.

The Lynch oceanographers have divided their 5-week operation into 2 phases as their ship travels east-west path over the area.

The Operations

Every 10 miles along the east-west course, they drop expendable bathythermographs. These are instruments used to detect and record the water's temperature distribution pattern in relation to depth. The bathythermographs are "expendable" because the scientists do not have to recover them to get the data. The instruments are catapulted over the ship's side and are connected by wire to recorders aboard the vessel. These recorders make a temperature trace as each bathythermograph sinks.

At stations on the survey area's borders, the scientists are using new instruments called STDs to obtain data to compute the relative current velocities and the volume of water coming through the area. They also are collecting temperature and salinity data with 13 Nansen bottles wired for different depths and lowered on one string to the ocean floor. Continuous surface measurements of salinity and temperature are being obtained.

Second Phase

Phase II of the operation was scheduled to begin August 9. Essentially it will repeat the bathythermograph tests of the first phase. The second readings compared with the first may give the scientists an idea of any changes in the course of the meanders.

The Lynch oceanographers hope to obtain preliminary analyses of data at sea. However, most of the data, and the information gathered by the airborne oceanographers, will be sent back for coordination at the Oceanographic Office.

Airborne Scientists

Concurrently, the airborne scientists will be flying over the same area on a north-south pattern. They will drop expendable bathythermographs at 45-mile intervals between the ship's lanes. Installed in airborne canisters, the bathythermographs will transmit temperature readings in relation to their depths by radio to the airborne scientists. The readings will be put on magnetic tape and fed to Oceanographic Office computers, which can either store the information or make graphic plots of the data.

The airborne scientists will make a surface-temperature survey and search for large "fields" of phytoplankton blooms--the visible evidence of great concentrations of microscopic marine plants. Because pilots on previous flights over the Gulf Stream noticed these "fields," a marine biologist is aboard the Lynch to find out what nutrients are causing the enormous phytoplankton growth and to collect samples of the organisms.

Oceanographers Study Histor / of N. Atlantic Ocean's Floor

Scientists aboard a modern oceanographic ship, the USNS "Kane," are trying to unravel the history of the North Atlantic ocean floor. The operation is part of Project GOFAR of the U. S. Naval Oceanographic Office to seek global understanding of ocean-floor geological processes and their relationship. This understanding could enhance the Navy's operational capability and increase knowledge of the ocean floor and its natural resources.

Mid-Atlantic Ridge

The Kane departed in late June. In early July, she was gathering data on a major underwater fracture zone in the Mid-Atlantic Ridge, created when the ridge crest was displaced laterally.

During the 2-month cruise over the fracture zone, the oceanographers are studying its magnetic signature, echo soundings, seismic reflection and seismic refraction. They are dredging at daily station stops over the underwater cliff formed by the earth's breaking movement. They hope the dredging may enable them to collect rock uncovered by the fracture. "Other station work includes piston coring, sea floor photography, temperature and salinity probes, heat flow investigations, and studies of the amount of sediment being carried in the water near the bottom."

All magnetic and topographic data are being fed into computers aboard the Kane, which are compiling profiles of the ocean floor.

The oceanographers are working up the data as they go and hope to have a good analysis of the cruise when it ends.

Off Northwest Africa

When the mission along the fracture zone is completed, the scientists will cruise for about a month off Africa's northwest coast before returning home along the path of a different, southern fracture zone. They plan to study the nature of the African continental rise, which is wider than the rise off the U. S. east coast.

Scientists know that an underwater current, acting as a submarine river, has deposited sediment along the continental rise off the east North American coast. The scientists aboard the Kane want to see if the situation is the same on the African side.

National Academies to Study U. S. Part in Ocean Exploration

The National Council on Marine Resources and Engineering Development (Marine Resources Council) has contracted for the National Academy of Sciences - National Academy of Engineering to carry out an initial study of the scientific and engineering aspects of U. S. participation in the International Decade of Ocean Exploration. The final report is scheduled to be submitted by April 1, 1969.

Vice President Humphrey, Council Chairman, said: "Since President Johnson proposed, last March 8, an International Decade of Ocean Exploration for the 1970's, both national and international response to this great concept has been most favorable. Now we are turning to the Academies to assist the Council in developing the U. S. contribution to the Decade and in identifying scientific and engineering goals, objectives, milestones, priorities, and timing."

Study's Other Purposes

The study will include the "identification of capabilities required to achieve these goals in terms of manpower, marine data, instrumentation, sea and shore facilities, and funds. . . . identify the end products that should be produced during the Decade such as charts, maps, research reports, and atlases. . . . be concerned with benefits to be expected in terms of advancements in science and engineering and in the Nation's capabilities to use the seas more effectively."

Scripps Finds Its 'Fish'

A $50,000, electronic, seafloor-mapping instrument lost in November 1967 on the ocean floor in nearly two miles of water when its towing cable broke has been located and recovered. It is working again for the Scripps Institution of Oceanography, University of California, San Diego.

The instrument is called FISH by the researchers of Scripps' Marine Physical Laboratory (MPL) who developed it. The 4-foot, 1,500-pound FISH carries 5 different sonar systems, plus photographic equipment and magnetometer. All are designed to provide information about the fine scale nature of the deep-sea floor.

Day FISH Sank

Dr. Fred N. Spiess, Scripps associate director and MPL's director, was aboard the "Thomas Washington" Nov. 19, 1967, when she was towing FISH during seafloor mapping 30 miles south of the tip of Baja California. About 13,000 feet of coaxial cable weighing 10,000 pounds was attached to FISH as it sank.

Dr. Spiess said several factors helped him and his colleagues locate FISH when they returned to the area recently aboard the Washington for additional bottom studies: the exact acoustic navigational data being obtained when the cable broke, the information recorded aboard ship from the sonars and magnetometer, and a duplicate FISH.

Dr. Spiess added: "We know of very few instances in which a piece of oceanographic gear has been lost at the bottom of the ocean and later recovered. But thanks to the mapping done by the lost FISH and the scanning of its sister, previously built as a spare, we again have both of the instruments available."

Lifting FISH

A Scripps-developed device brought the lost FISH to the Washington's deck. It was a device pulled across the ocean floor that grasped a cable between two plates held together by powerful springs. It was lowered and towed across the area where the map indicated FISH and its cable must be.

On the third crossing, the scientists noted an abrupt increase in the output of the cable strain gauge. This indicated they had hooked on to the submerged cable.

After 9 hours of maneuvering the ship and operating the winch that was lifting the FISH and the cable attached to it, the instrument was raised to the deck. Alongside the new FISH, it was returned to San Diego.

Found In Good Shape

Except for 2 non-anodized aluminum plates badly corroded, the lost FISH was in near-perfect condition even after 6 months on the ocean floor. The FISH was covered by a special epoxy paint applied by the Navy Electronics Laboratory Center in San Diego.

"We looked over the instrument, saw it to be in remarkably good shape, and are ready to use it on our next deep-tow ocean runs on the East Pacific Rise next January," Dr. Spiess said.

Coast Guard to Experiment With Buoy-Satellite System

The National Data Buoy Project of the U. S. Coast Guard will conduct a satellite communications experiment this fall from an ocean data buoy in the North Pacific Ocean. The communications equipment will be installed in the Office of Naval Research buoy "Alpha," which will be put in place later this year as part of the joint Coast Guard-Office of Naval Research-Scripps Institution of Oceanography "North Pacific Experiment."

Data will be transmitted from the buoy, located about 1,500 miles north of Hawaii, to a receiving station at San Diego, Calif., via the NASA ATS-1 satellite.

The Program

The test is part of the Coast Guard program to develop systems of unmanned ocean data buoys that will measure and report, continuously and automatically, important environmental information from remote ocean areas. This program was undertaken by the Coast Guard under the direction of the National Council for Marine Resources and Engineering Development. Ultimately, it will provide detailed weather and ocean information. The test results are expected to compare directly data telemetered by 2 types of radio transmission--single-sideband radio and a synchronous satellite relay.

The Coast Guard says this is the first instance of satellite-relayed information from an unmanned buoy moored in the deep ocean. The test program also will provide background information and experience in design and maintenance of satellite communications equipment capable of unmanned, long-term, operation in an ocean data buoy.

Tidal Current Charts for Upper Chesapeake Bay Available

The Coast and Geodetic Survey has published the first tidal current charts showing the speed and direction of the tidal current in Upper Chesapeake Bay. The new data appear on a set of 12 charts. The charts cover the bay from the Patuxent River to the Chesapeake and Delaware Canal.

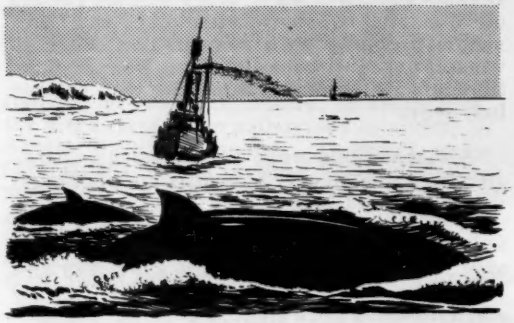
Each chart, 11 by 19 inches, provides a comprehensive view of the hourly speed and direction of the current throughout the 95 miles of the bay's upper half. It is a means of determining quickly for any time the speed and direction of the current at numerous places in the bay.

The new charts are useful to commercial shippers, boaters, and fishermen.

Copies may be purchased from the Coast and Geodetic Survey (C44), Rockville, Md., 20852, or from its sales agents, for $1 per set of 12 charts.

Navy Scientists Eavesdrop on Whale "Talk"

Probably never before have whales been pursued by men seeking only to listen in on their conversation. But in mid-August, scientists of the U. S. Naval Oceanographic Office and the University of Rhode Island sailed aboard the university's 180-foot research vessel, "Trident," into the North Atlantic for just that purpose.



They hope to track down and record sounds produced by several species of whales that inhabit the Newfoundland and Nova Scotia area. The scientists are using a variety of sophisticated acoustical devices.

Whale "Talk"

Sonar echoes from whales and those from submarines are similar. Whale "talk" has been known to create problems for the Navy's anti-submarine forces. The scientists are attempting to study the strength of echoes that result from bouncing sound off the mammals' bodies, record whale "talk," and correlate the behavior of whales with the sounds they make.

Foreign Fishing Off U.S. in June

IN NORTHWEST ATLANTIC

The persistent fog and haze that engulfed New England's offshore and coastal regions during much of June reduced aerial observations and prevented complete assessment of foreign fishing. About 125 vessels from the Soviet Union, East and West Germany, Poland, and Cuba fished in the Northwest Atlantic off the U. S. coast--about half the estimated 250 vessels sighted in May. More intense fishing off Canadian coasts (Newfoundland and Labrador) probably was responsible. Foreign vessels began withdrawing from New England fishing areas nearly 2 months earlier than last year.

Soviet vessels were most numerous. Judging from weekly surveillance sightings, it is estimated the Soviet fleet averaged 75 to 100 vessels; 103 different vessels were identified as 100 medium trawlers and 3 factory base ships. (During June 1967, 243 different vessels had been sighted.) No factory stern trawlers were sighted in June. The average 25 sighted stern trawlers per month during 1968 has been smaller than in earlier years, when 75 stern trawlers were not uncommon during the peak season. As in 1967, most of the Soviet stern trawlers were to the north, off Canada.

Eight West German, 1 East German, and 2 Cuban stern trawlers were also sighted.

Several Polish vessels were reported fishing off New England in June.

Soviet: Throughout June, the fleet was divided into groups generally dispersed along 30-fathom edge from south of Block Island, R. I., to southwest slopes of Georges Bank. The largest concentration was 20 to 30 miles south, midway between Block Island and Martha's Vineyard. Moderate catches on board were primarily herring and some mackerel. Smaller groups of vessels south of Nantucket Island and along eastern slopes of Georges Bank were taking herring, whiting, and some red hake.

West German: During scheduled Coast Guard patrol, June 18 to 21, 8 vessels (2 stern trawlers and 6 side trawlers) were located fishing along Northern Edge of Georges Bank--for herring at 40 fathoms.

Two side trawlers (estimated 160 feet) engaged in pair trawling were fishing about 100 yards apart. They were joined by their towing lines and a line running from one vessel's bow to the other's, held taut while vessels were towing (probably to maintain fixed distance). One tow lasted about 5 hours and produced meager catch of estimated 15,000 pounds of herring. The other 6 vessels were working as single trawlers.

This is the first evidence in 1968 of W. German side trawlers off U. S. east coast. During August-October 1967, at least 6 freezer stern trawlers fished herring on Georges Bank, east of Cape Cod and southern New England.

East German: It is assumed that 1 stern trawler was exploring on northern Georges Bank. Five freezer stern trawlers fished herring along Northern Edge of Georges Bank during August 1967, and 2 vessels remained off U. S. until early November.

Cuba: The stern trawler "Biajaiba" was sighted on June 19 fishing among Soviet fleet about 25 miles south of Martha's Vineyard off Massachusetts. A small quantity of fish on deck appeared to be herring.

Greek: The trawler "Paros" (1,500 gross tons) came to Boston on June 28 for supplies. She began fishing off east coast about June 1 and was not very successful. Only about 100 metric tons of herring, mackerel, squid, and cod were on board, frozen in blocks. Cod was principal target, but when not available other species were sought. If fishing continued poor, Greeks were expected to leave ICNAF area.

Japanese: No vessels were sighted. The Japanese Fisheries Agency "licensed" 3 stern trawlers to operate in area.

OFF MID-ATLANTIC

No reports or sightings of foreign vessels off mid-Atlantic in June.

The 2 Japanese stern trawlers reported there in May were not sighted. None of the additional vessels expected to "explore" have appeared.

IN GULF OF MEXICO
AND OFF SOUTH ATLANTIC

No vessels sighted fishing off U. S. Atlantic coast south of Cape Hatteras (including Florida) or off U. S. Gulf of Mexico coast.

OFF CALIFORNIA

Soviet: Six stern factory trawlers were sighted, 5 for first time this year off California. Vessels previously fishing departed.

Vessels were observed only during one week; remaining 3 weeks no Soviet fishing off California. All vessels were fishing when sighted June 13. One was 18 miles off Point Reyes, and 5 were 20-22 miles west of Klamath River mouth. Although the latter were close to shrimp beds, the catches were black cod, hake, and other bottomfish. Mesh size in cod end of net was $3\frac{1}{2}$-4 inches.

OFF ALASKA

Soviet vessels increased, Japanese effort decreased, and first South Korean independent factory trawler arrived.

Soviet: About 25 vessels were fishing off Alaska, about 15 more than at end of May 1968, only about two-thirds number sighted off Alaska in June 1967. As in June 1967, most activity was centered along Aleutians.

Nearly all effort in Soviet perch fishery was along Aleutians particularly on Stalemate Bank west of Attu Island. About 10 medium trawlers and 3 processing vessels arrived there in early June and fished through month.

As in 1967, no vessels in Gulf of Alaska fished for ocean perch during first-half June. About mid-month, one medium trawler and one stern trawler began exploring along 100-fathom curve in western Gulf. By month's end, only the medium trawler remained.

The trawl fishery for pollock, flatfish, perch, and gray cod off Continental Shelf edge in eastern and central Bering Sea declined from 9 medium trawlers in late May to about 5 in early June. This small fleet continued fishing through month and was located north of Fox Islands in eastern Aleutians at end of June.

The N. Pacific whaling fleets apparently remained in western and central N. Pacific, as in 1967, because more appeared off Alaska during June.

The fur-seal research vessel "Krylatka" was sighted about 60 miles west of Attu Island in early June.

South Korean: Early in June, the processing vessel "Sam-Sui 301" and her 6 pair trawlers were joined by a refrigerated fish-carrier "Sam-Su 201." By late June, an independent stern trawler of about 1,500 gross tons had begun fishing in eastern Bering Sea.

The Sam-Su 301 fleet spent most of June fishing just west of Pribilofs. In early June, the 6 trawlers were authorized to anchor in Akutan Harbor in eastern Aleutians, while Sam-Su 301 sailed to Sand Point to pick up new radio equipment. Many trawler crew members went ashore on Akutan Island. As a result of this unlawful entry into the U. S., the South Koreans were fined $10,000 by the U. S. Immigration Service.

The refrigerated transport vessel Sam-Su 201 entered Dutch Harbor near the end of June to purchase water. It was boarded by a BCF Resource Management Agent. The vessel was scheduled to return to South Korea July 1 with 4,000 metric tons of refrigerated whole salted Alaska pollock. The Sam-Su 301 and her trawlers reportedly were to return to Korea by the end of July.

An independent stern trawler off Alaska was sighted in late June on Bristol Bay "flats" northwest of Port Heiden, presumably fishing for flatfish and Alaska pollock.

Japanese: As in 1967, the vessels off Alaska decreased from over 300 in early June to about 250 in late June. The declines were caused primarily by dispersal of high-seas salmon fleets from south of Aleutians toward western North Pacific.

The transfer of 4 small stern trawlers from eastern Bering Sea, and arrival of large stern trawlers, increased Japanese effort in Gulf-of-Alaska ocean perch fishery from 4 trawlers in early June to 10 or 11 by mid-June. During second-half June, as in latter half of May, the Gulf effort declined as some trawlers moved south to British Columbia and others returned to Japan. Only about 3 trawlers remained at month's end.

The effort in the Japanese ocean perch fishery along Aleutians increased from a few vessels in late May to about 10 in early June. However, by month's end, only about 5 trawlers remained. Several vessels that fished along Aleutians during first-half June were trawlers working their way west along Aleutians to Japan.

Trawlers fishing for ocean perch along Continental Shelf edge in eastern and central Bering Sea varied from 5 to 8 vessels in June. Some vessels moved to Aleutians, then sailed home. They were replaced by others arriving from Japan.

The trawl fishery for Alaska pollock and flatfish to produce minced meat and fish meal was continued by 5 factoryship fleets in eastern and central Bering Sea. The fleets remained scattered on Continental Shelf from outer Bristol Bay to well northwest of Pribilofs.

The 2 crab factoryship fleets that moved from Continental Shelf of outer Bristol Bay to Pribilofs in May returned to outer Bristol Bay in June. A similar pattern was followed by the 2 fleets in 1967. Also, at least 3 other vessels engaged in pot crab fishing in eastern Bering, northwest of Pribilofs, in June. One vessel, a larger side trawler, served as processing vessel (presumably freezing) for at least 2 smaller vessels setting and retrieving pot gear. A similar fishery was conducted during summer 1967.

The long-line fishery for sablefish in Gulf of Alaska was continued by 2 vessels during first-half June. About midmonth, one vessel returned home and was followed later by the other.

In second-half May, up to 12 trawlers and 3 gill-net vessels fished for herring between Pribilofs and Togiak Bay in northern Bristol Bay. By June 1, the trawlers had quit and, shortly thereafter, the 3 gill-netters moved north into Norton Sound. A BCF agent boarded one trawler and was advised that trawling for herring had not been very successful. The trawlers were not able to fish their gear at midwater to near-surface levels to successfully take herring.

The high-seas salmon fishery, which began in late May, remained centered well southwest of western Aleutians through first week of June. Most fleets then began dispersing westward in North Pacific and Bering Sea. Only 3 fleets worked eastward during June--one fished south of Aleutians to near 180th meridian; then, by late June, it returned to southwest of western Aleutians. The other two moved northeast into Bering and fished along 180th meridian 200 to 300 miles north of Aleutians. Japanese sources reported an abundance of Asian salmon in western North Pacific and Bering Sea made it unnecessary for fleets to move into eastern longitudes, the pattern of previous years.

OFF PACIFIC NORTHWEST

Soviet: During June, 83 different vessels were sighted off Pacific Northwest. The number fluctuated with abundance of fish found off Washington or Oregon. Some weeks, the same vessel would be sighted off both States in same day.

The Soviets now use more stern trawlers than side trawlers in their Pacific Northern fisheries. In last week of June, they had 40 stern factory trawlers off Oregon and Washington--greatest number sighted in one week since they started fishing those waters in 1966.

The fleet found hake abundant off Washington and Oregon during June except for last week. Good to excellent catches, primarily of hake, were observed taken by both stern and side trawlers. As much as 40,000-50,000 pounds were taken in one observed haul. During June, there were 5 Soviet research vessels off Pacific Northwest.

Japanese: In June, only 3 stern trawlers were sighted off Pacific Northwest--2 during first week and third appeared later. No fish were seen on vessels; it is assumed they were searching for Pacific ocean perch.

Aid to Soviet Fishermen: The U. S. Coast Guard reported 2 Soviet fishermen from stern trawlers were evacuated to the hospital at Newport, Oregon.

Soviet Violations: On June 12, the U. S. Coast Guard (USCG) patrol from Port Angeles (Wash.) sighted the medium side trawler "Kamenii" fishing at 44°521 N. and 124°29' W., thereby violating the U.S.-USSR Agreement on North Pacific Fisheries. The agreement specifies that vessels under 110 feet "shall not engage in trawl fishing in areas of high concentrations of ocean perch." The patrol plane then dropped a message advising captain of violation and requesting him to leave. The Soviet Fleet Commander was also notified. Kamenii belongs to Kamchatka Fisheries Administration; her home port is Petropavlovsk-Kamchtskii.

Soviet violations again occurred on June 17, when a USCG patrol plane sighted 8 Soviet vessels where the USSR had agreed not to fish. Vessels were identified as 8 stern factory freezer trawlers. USCG plane dropped a block message warning Soviets of violation but received no positive response. Seattle USCG District Command then sent a cutter. When the cutter arrived, all Soviet vessels had left.

AN EVENING TO REMEMBER

Entertaining? Your elegant dinner can be an evening to remember if you open the first act with a colorful scene stealer, Tuna Cranberry Cocktail. Tuna, always a featured player in sandwiches, salads, and casseroles, attains star billing in this first course recipe. Tuna Cranberry Cocktail is refreshing, unusual, and has a secret--it's easy to do.

A popular adventurer from the briny deep, tuna joins forces with orange sections for tang and ruby-red cranberries for zest. Topped with a zippy whipped cream-horseradish dollop--this eye arresting and taste attesting cocktail adds a lift to the dinner that will intrigue your guests and be the highlight of the dinner-table conversation. The perfect first course--light, lovely, and luscious.

Tuna Cranberry Cocktail

1 can (6½ or 7 ounces) tuna
1 cup orange sections
¾ cup whole cranberry sauce
¼ cup whipping cream
1 teaspoon horseradish
Salad greens

Drain tuna. Break tuna into large pieces. Cut orange sections into bite-size pieces. Combine oranges and tuna. Whip the cream. Blend in horseradish. Arrange salad greens in sherbet glasses. Place about ¼ cup of tuna mixture in each glass. Place cranberry sauce over tuna mixture. Top each cocktail with whipped cream. Makes 6 servings.

STATES

Alaska

SCALLOP VESSEL
MAKES GOOD CATCH

After 8 days of fishing off Yakutat, the 90-foot New England scallop vessel "Viking Queen" recently landed 47,000 pounds of sea scallop meats in Seward, Alaska. It was one of the best catches reported anywhere in the world. It nearly equaled the total Alaska commercial catch off Kodiak of 50,000 pounds in the preceding 6 months.

The new commercial operation resulted from a combined State, Federal, and private industry project to test the practicability of a commercial scallop fishery in the Gulf of Alaska. The project was based on encouraging catches during explorations by BCF's "John R. Manning."

Production-Style Fishing

The combined project ended during the first week of June. It involved both exploration and simulated production-style fishing by the chartered Viking Queen. It was expected that by July 5 at least 5 more scallop vessels, including 3 New England craft, would be fishing the Alaskan grounds.

* * *

EDA FUNDS HELP
REBUILD CORDOVA DOCK

The Economic Development Administration (EDA) of the U. S. Department of Commerce recently approved a $1,284,000 grant and a $321,000 loan to help rebuild a burned-out dock and save jobs in the fishing community of Cordova, south central Alaska.

The construction of a dock will provide again the main avenue for movement of goods in and out of Cordova. These goods include the salmon pack from 4 local canners, which are the chief employers. The old dock was ruined by a major waterfront fire on April 4, 1968.

The New Dock

The dock is expected to stimulate the areas's economic development. It will serve the Alaska State Ferry System and tug-barge operations. The design plans include provisions to handle roll-on, roll-off cargo. Other facilities will be a concrete municipal dock, a crane to handle containerized cargo, and a storage area. Officials expect the dock to encourage development of a cold-storage facility.

* * *

KUSKOKWIM RIVER
SALMON CONTROVERSY

BCF Juneau reports that early in June Gov. Walter J. Hickel blocked a move by the Kuskokwim Fishermen's Cooperative to sell local salmon to the Japanese. The Governor explained that he was keeping the entire state's interests in mind. If a Japanese freezer ship were permitted to sail up the Kuskokwim to Bethel to receive the salmon catch without primary processing, it would set a precedent opening other ports throughout the state.

Hickel's main concern was that the fishermen's coop at Bethel had signed an agreement with the Japanese without consulting the state. He emphasized: "We cannot have an organization that moves through the international level."

1967 Sales to Japanese

In 1967, because there were no U. S. fish processors available to handle the Kuskokwim catch, the state permitted the sale of salmon to the Japanese. This year, 9 processors assured Hickel they could handle the catch.

However, on June 27, 1968, in a later development, Gov. Hickel issued a news release stating in part: "Because domestic salmon processors at Quinhagak and Bethel have indicated inability to handle record salmon catches at Quinhagak, Gov. Walter J. Hickel has invited the Japanese freezer ship 'Akitsu Maru' to purchase the fish. . . . the invitation to the Japanese is in complete harmony with State policy."

Oregon

FALL CHINOOK SALMON RELEASES COMPLETED

The Oregon Fish Commission completed in July the 1968 fall chinook salmon releases. A record 32 million young salmon were sent on their way to the sea.

About 10.5 million of the small salmon were released into the Willamette River this year. This continued the efforts of the Fish Commission and the U. S. Fish and Wildlife Service to create a fall run with an estimated potential of 100,000 adult fish.

Smaller releases were made into several Oregon streams: 1 million into the North Fork Nehalem River, 450,000 into the Trask, 60,000 into the Sandy, and 45,000 into the Siletz River.

Columbia Gets 20 Million

The Columbia River received the bulk of the fall chinook--20 million. State and Federal hatcheries work to maintain the Columbia's status as the world's largest producer of the valuable chinook species, despite staggering losses of natural habitat.

The biggest share of Columbia River chinook, both hatchery and naturally produced fish, are caught in the ocean sport and commercial fisheries from Alaska to California.

Several years ago, a BCF marking study revealed that Columbia River hatcheries alone contributed nearly 300,000 chinook worth an estimated 2 million dollars to sport and commercial fisheries.

Because fall chinook are caught primarily as 3- and 4-year-old adults, this year's releases will appear in sport and commercial catches in 1970 and 1971.

* * *

SALMON AND STEELHEAD CRISES ON COLUMBIA RIVER

Oregon Fish Commission biologists reported on July 19 that Columbia River salmon and steelhead runs were experiencing serious passage problems in the upper Columbia River.

More than 50 percent of the summer chinook salmon passing over Bonneville Dam up to July 19 had failed to appear on schedule at Ice Harbor Dam on the Snake River, or Priest Rapids Dam on the upper Columbia. On July 18, Fish Commission fisheries technicians counted 40 dead summer chinook salmon below John Day Dam--from the town of Biggs to the mouth of the Deschutes River. (Experience indicates that only few salmon mortalities resulting from such situations can be observed.) It suggested a substantial loss.

Biologists predicted that the "A" segment, or early-arriving summer steelhead run, would be the smallest on record. The Snake River segment of this run, once the dominant one, appeared to be at an extremely critical low level.

Shad Problem Too

Even the omnipresent shad, which recently extended its range far into the Columbia's upper reaches, apparently was experiencing serious difficulties at and below John Day Dam. Thousands were in the fish ladders at the dam, but few were passing into Lake Umatilla. Hundreds of these fish died in the days before July 19 and drifted downstream.

California

SEA OTTER PROGRAM PROPOSED

California's Department of Fish and Game (DFG) has recommended to the legislature a program to lessen the competition between commercial abalone divers and sea otters in the coastal waters off San Luis Obispo County. It seems that sea otters like to eat abalones (marine snails) as much as people do. The program also would accumulate valuable information for preserving the California sea otter--and seek ways of expanding the commercial abalone fishery.

The commercial abalone fishery centers on central and southern California areas and the offshore islands.

The principal species sought are red and pink abalones. Since 1959, the value of landings has ranked between No. 8 and No. 12 among all California fisheries.

The Program: Phase I

The program proposed calls first for trapping, tagging for study, and removing 20 sea otters from the Cambria-Point Estero area.

Other otters would be put in scientific institutions for further study. The remainder would be moved to the state's sea otter refuge north of Lopez Point in Monterey County.

During this 3-year first phase, DFG biologists "would study the animals to determine the effect of transfer, evaluate the breeding success among the affected otters, and begin ecological, environmental and population dynamics studies on the otters."

Phase II

The second phase would be based on information gained during the first phase. It calls for further "ecological, tagging and population studies." Also, sea otters would be removed from abalone-producing areas if this did not endanger the otter population.

Walter T. Shannon, DFG Director, said: "The California sea otter is a rare and unique species, and we have an important responsibility to protect it from the threat of extinction."

* * *

ANCHOVY REDUCTION FISHERY FELL BELOW 10% OF QUOTA

California landings of anchovy taken for reduction purposes were only 6,506 tons when the 1967/68 season closed on May 15. This was reported by the California Department of Fish and Game. Landings were below 10 percent of the 75,000-ton quota for the season that opened Sept. 15, 1967.

Of the 6,506 tons, 5,654 tons were taken in the Northern Permit area, north of Pt. Conception. There, landings early in the season were on an open-ticket basis.

The 1967/68 season catch was down 31,109 tons from 1966/67 and 10,337 from 1965/66. The decline is attributed partly to 5-months-less fishing effort due to price negotiations.

The price for anchovy was set at $16 per ton--$4 below the previous 2 seasons.

* * *

TUNA TAGGED OFF CALIFORNIA CAUGHT NEAR JAPAN

A bluefin tuna tagged off Baja California 4 years ago was caught off Japan's east coast, reports the California Department of Fish and Game.

The tuna was tagged Aug. 13, 1964, near San Martin Island, in a cooperative research program of the California Department and BCF. It was landed 4,736 miles away, on July 4, 1968, after 1,421 days of liberty.

The Tuna

The fish was 2 years old and weighed 29 pounds when tagged; it was 6 and an estimated 171 pounds when captured by a purse seiner off Osaki Zaki.

Bluefin tuna up to 850 pounds have been reported in Japanese waters. The California record for a sport-caught fish is 251 pounds; the commercial record is 297 pounds.

Maine

JUNE 1 CANNED SARDINE STOCKS 200% ABOVE YEAR EARLIER

Canners' stocks of Maine sardines on June 1, 1968, were 231,000 cases greater--over 200 percent--than a year earlier.

Type	Unit	6/1 68	6/1/67	6/1/66	6/1/65
Distributors	actual cases	222,000	193,000	208,000	198,000
Canners	std. cases[1/]	342,000	111,000	248,000	203,000

1/ 100 3¾-oz. cans equal one standard case.

Source: U. S. Department of Commerce, Bureau of the Census, June 1, 1968.

1968 Pack

The 1968 pack, as of June 15, totaled 456,000 standard cases, according to the Maine Sardine Council. This was 212,000 cases more than the 244,000 cases packed in the 1967 period.

Fishing was spotty during late May and early June and limited the canners' pack along the New England coast.

Maryland

MENHADEN KILL IN CHESAPEAKE BAY UNDER STUDY

BCF is cooperating with Maryland in a study of the cause of menhaden mortalities in Chesapeake Bay. The Bureau has made available the services of its Oxford (Md.) laboratory.

During late spring-early summer, the menhaden kill occurs in the Atlantic bays and estuaries. The symptoms include a loss of equilibrium. This culminates in the fish swimming in tight circles at the surface. They are called "spinners."

This year, the kill in Chesapeake Bay started in early June and does not seem as heavy as in previous years. Spinners and dead fish have been seen from below Baltimore harbor to about the mouth of the Patuxent River.

The Spinning Behavior

The spinning behavior is a common distress symptom among fish suffering from a disorder of the central nervous system. The cause of menhaden mortality remains a mystery. Several years ago, at Raritan Bay, N. J., researchers suggested the cause was a gas embolism in the brain, possibly from supersaturation of nitrogen in the water. But, in 1967, an attempt at Johns Hopkins University to duplicate this condition in the lab failed. An attempt also has focused on a possible virus infection. And the Maryland State Health Department examined dead fish and tissue cultures for possible pathogenic bacteria. All these investigations failed to find the cause.

At Oxford Lab

The researchers at BCF's Oxford lab will look for possible pathogenic viruses by using the latest tissue-culture techniques.

* * *

3-YEAR ROCKFISH MIGRATION STUDY NEARS END

Over 5,000 young rockfish (striped bass) were tagged in the upper Chesapeake Bay this year as part of the concluding phase of a 3-year study by University of Maryland scientists into the migration and growth of the fish. The fish is the most important in Chesapeake Bay. The program is financed by Federal and state governments. For the past 2 years, the program has consisted mainly of tagging and recovering very small rock, a size never before tagged successfully.

A small ($\frac{3}{16}$" by $\frac{5}{8}$") green tag is attached to the back or underside of the rock by a thin, stainless-steel wire. A swivel-type arrangement allows the tag to dangle freely. This tag made the research possible.

Recapture Data Valuable

Valuable knowledge about growth, movement, and other aspects of the fish can be gained from recapture information. Project biologists believe it may lead to better use of the species, and to better fishing, as knowledge of movement patterns becomes more definite.

Reward Offered

Dr. Ted S. Y. Koo of the University's Chesapeake Biological Laboratory at Solomons, Md., says that a reward of $1.50 will be given for the return of fish and the tag, and $1 for the tag alone. It is essential that information on date, place, and method of capture be included. Dr. Koo requests all fishermen who land tagged rock to put them in a freezer as soon as possible and contact him either by telephone or letter. The phone number: area code 301, 326-3121.

BUREAU OF COMMERCIAL FISHERIES PROGRAMS

Film Shows Lobster Enters Trap-- Then Keeps Out Others

BCF researchers looked at a film strip showing activity around new BCF-designed deep-sea lobster traps and saw something both valuable and disturbing to them and to lobstermen. As soon as one lobster entered a trap and captured the bait, he defended the entrance against any others that sought to enter! More tests are planned to check this finding. If necessary, trap design changes will be made to correct it.

BCF's Gloucester (Mass.) Technological Laboratory and the Exploratory Fishing and Gear Research Base are cooperating in studies of the best methods of trapping these lobsters.

Researchers Transplant Oysters Earlier To Cut Spring Silting Loss

BCF's Milford (Conn.) laboratory is determining whether transplanting oysters in late March and early April is a successful way to prevent the mortalities that occur when oysters begin pumping later in the spring and smother in silt.

This spring, 4 commercial companies transplanted 100,000 bushels of oysters earlier than usual to avoid such mortalities. One area along the edge of a bed in New Haven harbor served as a "control." Here, oysters began dying between March 29 and April 12 and continued to die through May. Total mortality was about 30%.

Earlier Transplant Better Off

The mortality of oysters transplanted earlier from this bed to a bed with no silt was less than 2%. Inspections of oysters transplanted early in Norwalk, Conn., also indicated losses under 2%.

Irradiation at Sea Improves Quality of Perch

BCF Seattle, Wash., reports recent tests demonstrated that low-level irradiation of whole Pacific Ocean perch at sea produced "significant improvement in the quality" during the normal period of iced storage.

After 11 days, fish irradiated at 50, 100, or 200 kilorads, either in prerigor or rigor state at sea and iced, were of good quality. Those irradiated ashore 5 and 8 days after catching, though acceptable, were only of fair quality.

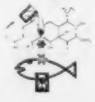
Fair After 15 Days

After 15 days, the fish irradiated either at sea or ashore at 100 kilorads were of fair quality. Those irradiated at the lowest level of 50 kilorads--and the unirradiated fish--were spoiled.

The fish irradiated at 100 kilorad level were acceptable up to 20 days after catching. Therefore, low-level irradiation extended shelf life 4 to 5 days.

First 11 Days Important

The BCF researchers say that the major advantage in irradiating Pacific Ocean perch at sea appears to be improved quality during the first 11 days. During this period, the fresher flavor of fish irradiated at sea "would be more apparent and, therefore, of greatest consumer benefit."

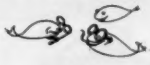


Fish Respond More to Speed Changes by Fish on Either Side

Researchers of BCF's Fishery-Oceanography Center at La Jolla, Calif., have analyzed data on how changes in the speed of Jack Mackerel schools are communicated. Their analysis reveals that the latency of a response by one fish to another fish's change in speed depends on where it has seen the movement. "The velocity of the response depends on the extent to which the other fish increases its speed and the relative angular position of that fish," the researchers report.

Fish On Side Greater Stimuli

Fish respond more strongly to speed changes by fish to left or right of them than to those in front or behind. They respond to all speed changes by all fish in their visual range--but they adjust their speed more closely to fish on either side.



Geographical Differences in When Bluefin School Types Appear

Analysis of logbook data on bluefin schools recorded by U.S. tuna fishermen reveals geographic differences in the occurrence of school types, reports BCF La Jolla. Seventy percent of the 701 breezing schools caught by purse-seine fishermen in 1960-67 were south of 29° N. latitude; 30% were north.

Feeding Behavior & Food

The La Jolla scientists suggest that differences in feeding behavior might be responsible for these differences. North of 29° N., anchovies are a major part of the bluefin's diet; south of it, red crab are important. Boiling and jumping of tuna occur when schools feed on anchovies or other small fishes. Breezing, which is the rapid swimming of fish just beneath the surface, "might be associated with filter feeding by bluefin for red crabs."

Barnacle Check Aids Sardine Council

BCF's Biological Laboratory at Boothbay Harbor, Maine, monitors the abundance of barnacle larvae in the water and informs the Maine Sardine Council when and where barnacle larvae are abundant. The lab performs this service because sardines that feed on young barnacles are not suitable for canning and its information permits more efficient use of the resource.

Film on 'Mullet Country' Released

"Mullet Country," a 14-minute, 16-mm. color film that focuses on mullet as a quality food, has been released by BCF. It was produced in cooperation with the Florida Board of Conservation using matching Federal and state funds. Florida is the Nation's No. 1 mullet state.

Mullet Story

The film, the 23rd circulated by BCF, traces the story of the mullet to the Romans, Egyptians, and Polynesians. It includes the biology of the species and demonstrates the 3 major commercial fishing methods. Techniques of processing, cooking, and serving are shown. The film features scenes in St. Augustine, Tarpon Springs, and the Everglades.

'Common Sense Fish Cookery'

BCF has developed a training kit for people working with low-income groups on how to buy, handle, and prepare fishery products.

The kit, titled "Common Sense Fish Cookery," is written in English and Spanish at elementary-school level. It is designed for use as a teaching aid. Together with a film strip now being produced, the kit will help low-income families get the most out of their food money by buying fishery products available in their neighborhoods.

'Delaware' Continues Lobster Explorations With Pot (Trap) Gear

BCF's Delaware returned to Gloucester, Mass., on June 27 after completing the second in a series of northern lobster (Homarus americanus) investigation cruises. (Cruise 68-5, May 24-June 27.)

Cruise 68-5 had 3 parts: 1) grappling for pot gear lost during March-April lobster explorations (Cruise 68-3); 2) continued explorations in Continental Slope area; 3) trapping explorations in shallow water areas within Gulf of Maine and on Georges Bank.

Grappling Gear

The loss of 3 strings (trawls) of lobster traps during the initial offshore trapping cruise demonstrated the need for an effective method to retrieve such lost gear. A special effort was made between the 2 cruises (68-3 and 68-5) to design and assemble equipment suitable and dependable for this purpose. The staff of the Gloucester Exploratory Fishing and Gear Research Base believes the existence of proved grappling equipment will help to minimize gear losses during future operations. It will significantly encourage the developing offshore lobster trapping fishery.

Several improvised grapnels were tried during the latter part of the March-April cruise immediately after the traps were lost. None was successful. The gear for the second cruise was designed to overcome the shortcomings of the first devices.

The new grapnels were made from five 12-foot lengths of $\frac{5}{8}$-inch galvanized steel chain to which steel hooks were attached. The chain sections were spaced along and attached at one end to a 10-fathom length of $\frac{3}{4}$-inch wire rope. Each chain was fitted with 4 single-prong hooks spaced along its length and a terminal 4-prong grapnel. The single-prong hooks were arranged to spiral around the chain and were individually attached to the chain by welds, which traversed 3 successive chain links. All grapnel prongs were made from $\frac{3}{4}$-inch round steel stock.

Grappling Operations

Part I, Cruise 68-5, was spent grappling. The grapnel array was towed with the ends of the $\frac{3}{4}$-inch wire attached to a pair of otter doors; this spread the wire similar to towing an otter-trawl net. The towing speed was kept as slow as possible. During grappling, the resistance of bottom to grapnel was measured by a hydraulically operated tensiometer. When the drag increased beyond the range normal to type of bottom searched, the gear was hauled in to determine what had caused the increased resistance. Debris was hauled aboard before the pots were found.

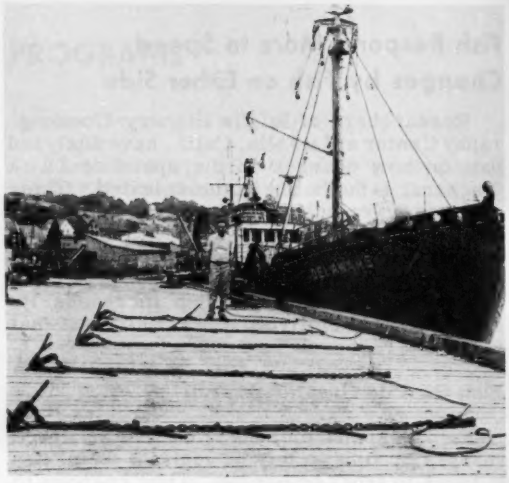


Fig. 1 - The grapnel "array" used to retrieve 19 lobster pots lost in 175 to 210-fathom depths on the Continental Slope.

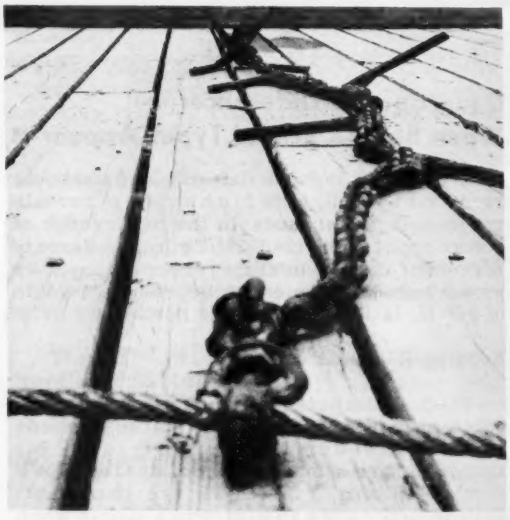
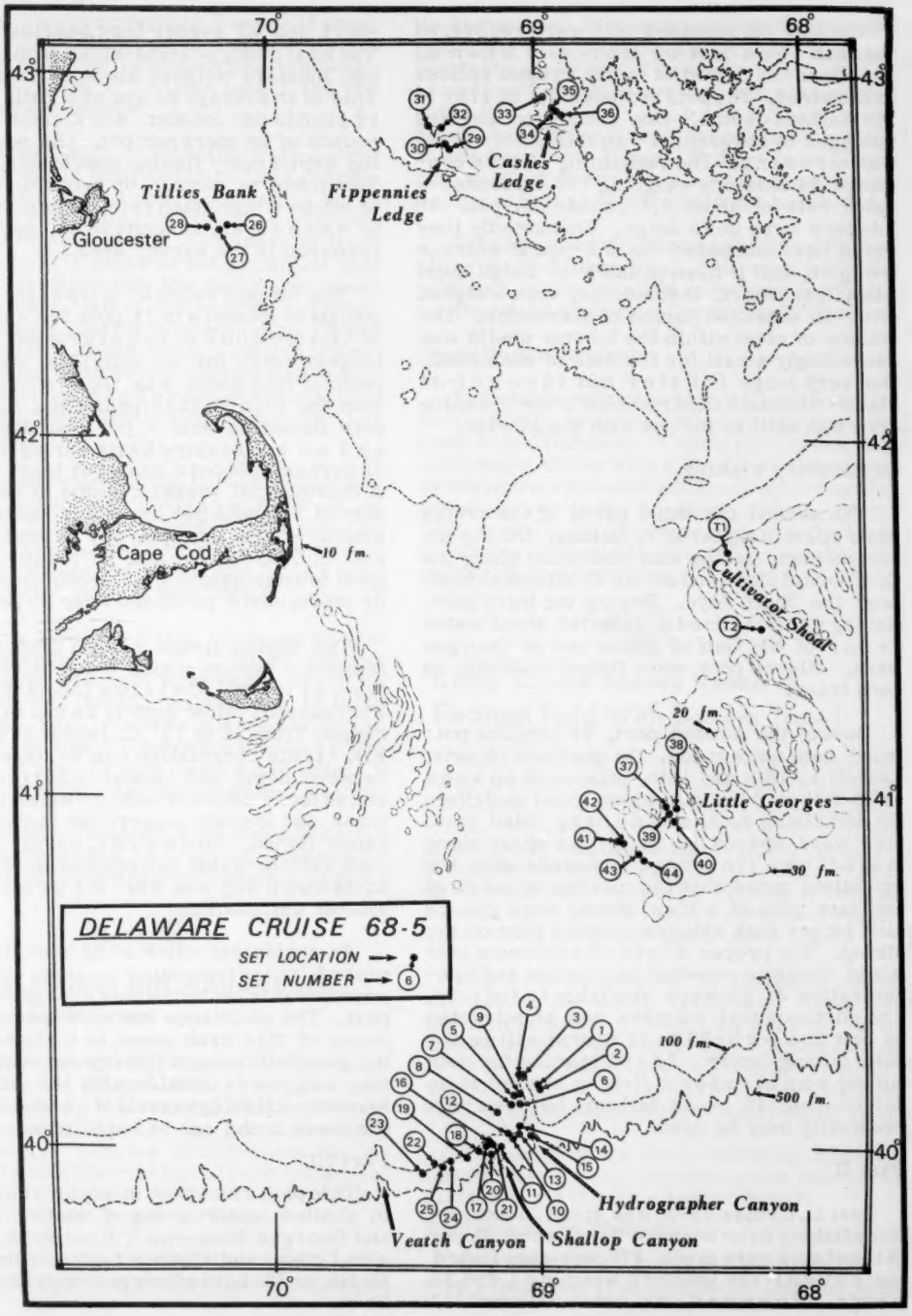


Fig. 2 - Single length of chain on the grapnel "array." The chain snakes over the bottom in close contact with the surface. At least 2 of the single prong hooks, as well as 2 prongs of the terminal 4-prong grapnel, usually maintain bottom contact.


70°
69°
68°
43°
42°
41°
40°
Tillies Bank
Fippennies Ledge
Cashes Ledge
Gloucester
Cape Cod
10 fm.
Cultivator Shoal
20 fm.
Little Georges
30 fm.
100 fm.
500 fm.
Hydrographer Canyon
Veatch Canyon
Shallop Canyon
DELAWARE CRUISE 68-5
SET LOCATION
SET NUMBER

On May 26, nineteen pots were recovered that had been lost on March 17 when all buoylines had parted at faulty swaged splices in the wires. The pots had been set in 175- to 210-fathom depths. One recovered pot was damaged by the grapnel--an entire side panel was missing. The remaining 18 pots contained 24 lobsters weighing 156.5 pounds--a catch rate of about 8.7 pounds per pot. All lobsters were quite large. Undoubtedly they would have exceeded the 6.5-pound average weight, had it been possible to weigh them when first caught. Instead, they were weighed after an extended period of starvation. The volume of meat within the lobster shells was exceedingly small for the size of each shell. One very large lobster had thrown both claws--the blackened remnant of the crushing claw was still in the pot with the lobster.

Exploratory Fishing

The second and third parts of the cruise were spent in exploratory fishing. During the second part, fishing was conducted along the Continental Slope and on the Continental Shelf near the Shelf edge. During the third part, fishing was conducted in selected shoal water areas of the Gulf of Maine and on Georges Bank. Eleven pots were fished routinely on each trawl.

During the second part, 25 longline pot-trawl sets were made. On the first 15 sets, as well as 18th and 19th, pots were spaced at 10-fathom intervals along trawl mainline. On remaining sets, and during third part, pots were spaced 20 fathoms apart along mainline. The change was made after the scientists noted that the catches of the first and last pots of a trawl string were generally larger than catches of other pots on the string. The proper distance between pots would depend somewhat on number and concentration of lobsters available to the pots. The distance that lobsters can be attracted by bait to a pot (in 20 to 24 hours) will be the determining factor. Ideal spacing for pots during exploratory fishing has yet to be determined; 25 or 30 fathoms between pots eventually may be used.

Part II

Part II, Cruise 68-5, was spent in exploratory fishing on or near the Continental Slope; 25 trawl sets were made, 275 pots were fished and caught 756 lobsters weighing 1,259.25 pounds. However, the catch included 112 short and 27 seeder (egg bearing) lobsters. The total catch of legal-sized, non-egg bearing, lobsters weighed about 1,068.25 pounds. This is an average weight of a little less than $1\frac{3}{4}$ pounds per lobster, and a catch rate of $2\frac{1}{4}$ pounds of lobsters per pot. (As normal during exploratory fishing operations, no effort was made to remain on productive grounds to attain a high catch rate. The objective was to assess the magnitude and nature of the resource in the survey area.)

The largest catch by a trawl set was $158\frac{1}{2}$ pounds of lobsters in 11 pots for a catch rate of 14.4 pounds of lobsters per pot. The largest catch for an individual pot was $30\frac{1}{2}$ pounds; this catch was from a different set than the record $158\frac{1}{2}$-pound set. Of the 275 pots fished on both a pot gear development and an exploratory basis during this part, 38 percent (105 pots) caught at least 5 pounds. A commercial vessel capable of hauling and setting 200 pots per day could average 1,000 pounds of lobsters per day at average catch rate of 5 pounds per pot. Of the 105 pots with good lobster catches, 46 produced 10 pounds or more, and 6 produced over 20 pounds.

The depths fished ranged from 63 to 162 fathoms. Bottom-water temperature ranged from $9\frac{1}{2}$ to $12\frac{1}{2}^{\circ}$ Celsius (about 49 to $54\frac{1}{2}^{\circ}$ Fahrenheit). Most bottom temperatures ranged from 11 to 12° C. (about $51\frac{3}{4}$ to $53\frac{1}{2}^{\circ}$ F.). Little correlation can be found, as yet, between depth and lobster occurrence; none can be found between bottom-water temperatures and lobster occurrence in the thermal range fished. (However, during the third part, bottom-water temperatures of 3 and 4° C. (about $37\frac{1}{2}$ and $39\frac{1}{4}^{\circ}$ F.) produced no lobster catches.)

An incidental catch of 88 bushels of rock crabs (Cancer irroratus) weighing about 3,520 pounds was taken by the pots during the second part. The abundance and widespread occurrence of this crab seem to indicate a large but generally unused fishery resoruce. This may augment considerably the earnings of lobster pot fishing vessels if a suitable market for these crabs can be established.

Part III

This part was spent in exploratory fishing in shallow water areas of the Gulf of Maine and Georges Bank--on Tillies Bank, Fippennies Ledge, and Cashes Ledge in the Gulf of Maine, and in Little Georges area on Georges Bank.

No lobsters were caught in 3 sets (33 pots) fished on Tillies Bank, or in 4 sets (44 pots) on Fippennies Ledge; bottom-water temperatures were $3\frac{1}{2}$ and 4° Celsius (about $38\frac{1}{4}$ and $39\frac{1}{4}^{\circ}$ F.), respectively.

On Cashes Ledge, 2 lobsters were caught by 22 pots set in bottom-water temperature of $4\frac{1}{2}^{\circ}$ C. and 4 lobsters were caught by 22 pots set in $5\frac{1}{2}^{\circ}$ C. water. As the general direction of water flowing into these areas is from the north, the scientists do not anticipate that future explorations into the deepwater areas of the northern Gulf of Maine will find many areas of heavy lobster concentration. However, limited areas of very shoal water, where mixing with surface water can maintain a somewhat higher temperature, may produce lobster catches of commercial significance.

The temperature of the bottom water was taken in 2 areas near Cultivator Shoal on Georges Bank (northeast from Little Georges area). Near northwest side of Cultivator Shoal, the water was $7\frac{1}{2}^{\circ}$ C. and, near southwest side, it was $10\frac{1}{2}^{\circ}$ C.

On Little Georges Bank, temperature ranged between 9 and 10° C. (about $48\frac{1}{4}$ and 50° F.). Five of 8 sets were made in 10° C. water. Depths fished ranged from 18 to 35 fathoms. Few lobsters were taken; the largest set was 4 lobsters weighing $19\frac{1}{2}$ pounds. From 88 pots fished (8 sets), 9 lobsters weighing $42\frac{1}{2}$ pounds were caught.

Twelve live lobsters were brought in for further photographic studies of lobster reaction to lobster pots of experimental design.

'Rorqual' Studies Brit Abundance Off Northeast Coast

The M/V Rorqual returned to Boothbay Harbor, Maine, after a 2-week cruise from Cape Ann, Mass., to Eastport, Maine. (Cruise 5-68, June 24-July 8.). Its mission was to determine the relative abundance of the inshore-offshore distribution of post-metamorphosed herring--brit--and to sample the environment where they were found.

Preliminary findings disclosed brit were widely distributed inshore from Eastport to the eastern half of Muscongus Bay; there were relatively high concentrations from Machias Bay to the upper half of Penobscot Bay. A less pronounced distribution and abundance was noted from lower Penobscot Bay to Cape Small, except for a very large concentration in the Sheepscot River. Traces from Casco Bay westward were very light and scattered, and the presence of brit could not be verified.

Traces were infrequent and light offshore along the 50-fathom line. Brit were captured offshore in one location only--about 6 miles southeast of Cutler in Grand Manan Channel.

Operational Program

The ship's echo-sounder was operated continuously over the entire cruise transect from 5 to 50 fathoms. Twenty-five trawl tows were made either with a Boothbay Depressor or shrimp try net on significant echo-sounder traces to verify the presence of brit. Sixty-four surface temperature and salinity samples were collected at selected transect points and at all tow locations.

'Kaho' Cruise Shows Value of Electrical Field With Bottom Trawl

Electro fishing gear research and development studies were conducted aboard BCF's R/V Kaho in Lake Michigan off Saugatuck, Mich., May 14-June 14. The primary purpose of Cruise 48 was to test and evaluate the effect of an electrical field supplied to a bottom trawl on its catch rate--and to determine if catches were influenced by a visual response of freshwater fish to various electrode arrays.

Improved techniques for sampling young, and harvesting adult, freshwater fishes are the ultimate objectives of the studies. Preliminary work has shown that electro fishing devices hold considerable promise as alternative methods of harvesting species not readily available to conventional fishing gear.

Results of the three retention systems tested favored considerably the use of an electrical field with a bottom trawl.

Equipment and Methods

The electrified trawl tests were made in 6 to 9 fathoms in the Saugatuck-Holland area.

A 41-foot (headrope) Gulf-of-Mexico-type flat trawl was equipped with electrode arrays supplying an electrical field designed to retain fish in a net. The cathodes consisted of lengths of braided, tinned-copper wire tubing, fitted with a smaller diameter braided nylon inner core and a larger diameter braided nylon outer covering. The cathode array consisted of twenty-three 10-foot lengths of electrode material secured to the headrope and foot rope at 2-foot intervals. The anode (postive electrode) array consisted of 3- by 6-foot sheets of bronze screening attached around the body of the net 5 feet behind the cathode.

A commercial, solid-state, direct-current pulsator supplied electrical values through 500 feet of primary electrical cord (10/2) of 10 pulses per second (PPS) at 20 milliseconds duration. Water conductivity at the lake bottom ranged from 210 to 250 microohms per centimeter, and field voltage ranged from 0.6 to 1 volt per inch.

The researchers tested one electrode array design with 3 values of electrode surface area, including: (1) anode and cathode of equal areas, (2) anode area equal to one-half cathode area and (3) anode area double cathode area.

Tests were also made on the visual response of fish to the electrode system. One hundred ninety 10-minute drags were made. Fish were counted and weighed for all drags and length frequencies taken every 5th pair of drags. Water conductivity and field voltage in the net were measured periodically. Scuba divers ascertained electrode array and trawl configuration before testing started.

Results

Efforts were concentrated on retaining fish in a trawl and on visual response of fish to electrode material. Table 1 data indicate a definite visual response of fish to electrode material since more pounds of each species were caught with no electrode arrays in net compared to net with arrays.

Table 1 - Catch Results of Important Fish Species with Electrode Arrays--Versus Results without Electrode Arrays in a 41-Foot (Headrope) Flat Trawl

Species	With Electrode Arrays (12 Drags) Total Pounds	Without Electrode Arrays (12 Drags) Total Pounds	Percent Difference
Alewife . . .	649.5	660.0	3.1
Chubs	207.3	218.3	5.3
Yellow perch	0.2	2.1	950.0
Lake trout . .	3.7	11.5	210.8

Table 2 - Catch Results of Important Fish Species with Electrical Field--Versus Results without Electrical Field in a 41-Foot (Headrope Flat Trawl

Species	With Electrode Arrays (71 Drags) Total Pounds	Without Electrical Field (71 Drags) Total Pounds	Percent Difference
Alewife . . .	4,190.9	3,173.6	32
Chubs	256.8	145.6	76
Yellow perch.	21.2	3.3	542
Lake trout . .	23.9	14.4	65

Table 2 summarizes fishing results, with and without electrical field, for important species. The results of 142 experimental 10-minute trawl drags (71 with electrical field and 71 without) showed higher overall catch rate for the electric trawl: alewife, 32% increase; chub, 76% increase; yellow perch, 542% increase; and lake trout, 65% increase. Modest amounts of other species were also taken.

Of the 3 retention systems tested, best overall results were obtained with the anode surface area equal to one-half cathode area. This system was also more selective for larger species and more effective for capturing alewife and chub, including young-of-the-year chub.

The Work Ahead

Future work will include testing arrays designed to extend fishing area in front of bottom, near bottom, and midwater trawls. These arrays will use the same commercial electro fishing equipment and have a more powerful freshwater fish-electro-motivator system. The latter being developed in cooperation with the Electrical Engineering Department, University of Michigan.

'Cobb' Explores for Scallops Off Washington

BCF's John N. Cobb returned to Seattle, Wash., on June 14 after a 19-day exploratory scallop fishing cruise off the Washington coast (Cruise 95). The basic objective was to locate and delineate concentrations or "beds" of the weathervane scallop (Patinopecten caurinus).

Secondary objectives were to collect biological data, including information on meat yields, and to determine associated fauna captured by the dredge.

An 8-foot New Bedford scallop dredge with 3-inch rings was used throughout the survey.

Method of Operation

The sampling procedure followed a predetermined grid pattern in which ½-hour hauls were made parallel to the coast at 5-fathom increments from 30 to 60 fathoms. The grid lines were started just south of the Umatilla Lightship and spaced 5 miles apart; the last line occurred off the Columbia River. Whenever an individual haul yielded at least 1 bushel of scallops, additional hauls were made in the immediate area.

The catch from each haul was sorted, counted, and weighed. All scallops were measured; the height[1/] was taken to the nearest millimeter with a Vernier caliper. Samples of scallops were retained and frozen for meat yield analysis by BCF's Technological Laboratory in Seattle.

Results

Seven drags were made along each of 15 grid lines. The speed of tows ranged from 2.8 to 5.6 knots and averaged 4.4 knots.

No scallops were found in the 30-fathom depth interval. Abundance was highest at 50 fathoms, where the average catch was 32 scallops per ½-hour haul. The largest catch (257 scallops) occurred at the 50-fathom station in row 14 off Breakers, Washington. Eight ½-hour hauls made around this station ranged from 0 to 23 scallops and averaged 7 scallops per haul. The second largest catch (140 scallops) occurred at the 45-fathom station, in row 6, off the Raft River. Eight ½-hour hauls made near this station ranged from 17 to 114 scallops; the average was 56 scallops per haul.

Scallops ranged in height from 2 to 5.5 inches and averaged 4.2 inches. Data on size composition and meat yield of scallops taken in the 2 largest catches show:

1/ The distance from the posterior margin of the hinge to the leading edge of the shell in a line perpendicular to the hinge.

Location	Depth (fm.)	No. of Scallops Per Bushel	Average Height (in.)	Average Meat Yield (%)
Breakers, Wash.	50	140	4.3	9.8
Raft River, Wash.	45	195	4.1	8.7

Meat yield data were provided by the Seattle Technological Laboratory.

Incidental Catch

Catches of incidental species were small and similar to those made during scallop surveys off Oregon in 1963 and 1967. A variety of starfish was found. Dungeness crabs were commonly taken in shallow water near the Columbia River.

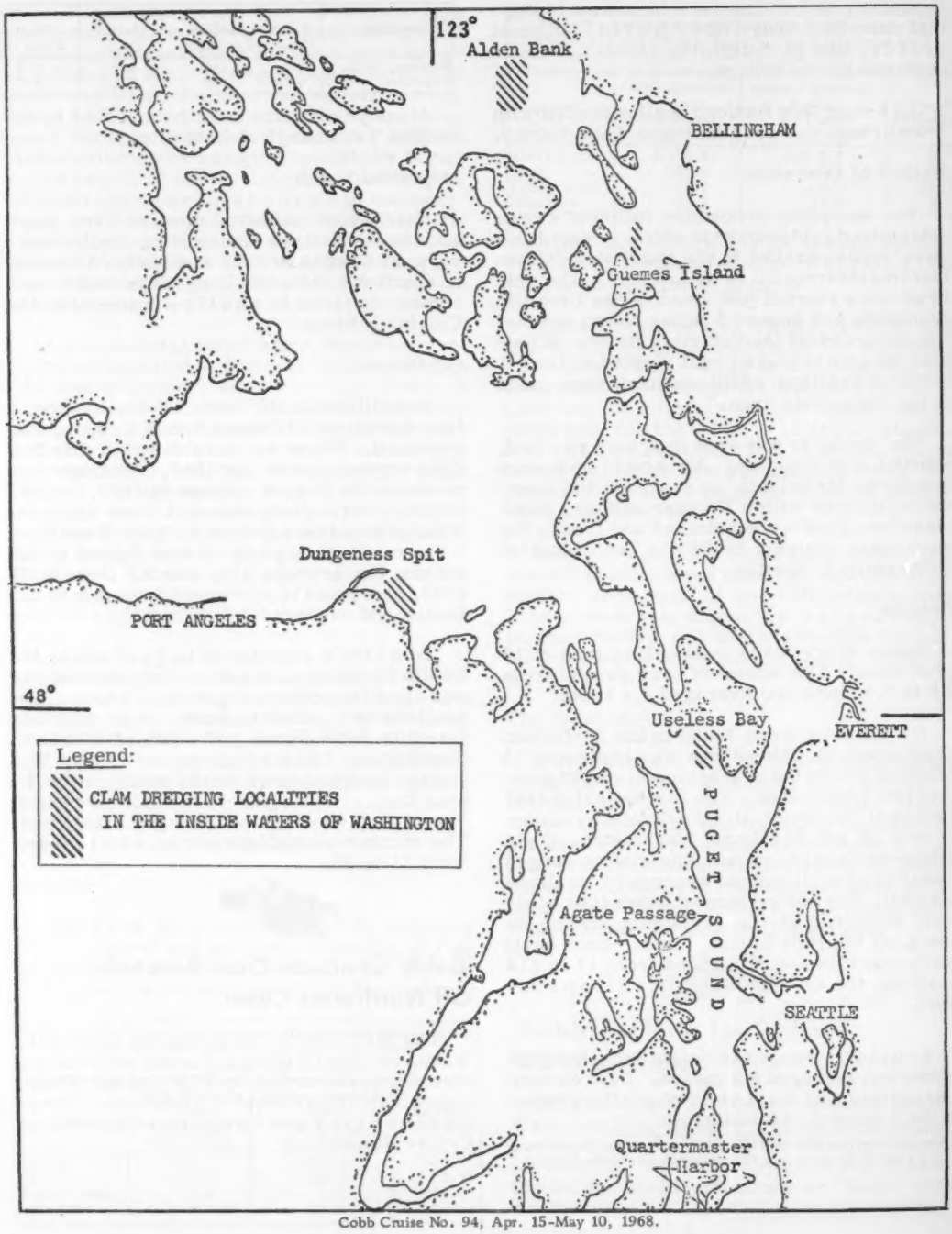
Off Oregon

In addition to the work off Washington, a line of stations off Cannon Beach, Oregon, was surveyed. These had been sampled during Cobb surveys in 1963 and 1967. Although they produced the largest catches in 1963, in 1967 scallops were nearly absent at these stations. This year a few small catches of scallops were made, ranging in size from 3 to 4.5 inches; the average size was 3.6 inches. In 1963, the scallops ranged from 3.1 to 5.1 inches and averaged 4.2 inches.

To obtain samples of large scallops for BCF's Technological Laboratory, the last day was spent in northern Puget Sound where large scallops are known to exist. In an area adjacent to Alden Bank, just south of Blaine, Washington, 732 scallops were taken. The catches ranged from 2 to 160 scallops per ½-hour haul. The height of the scallops ranged from 3 to 6.6 inches and averaged 5.4 inches. The number of scallops per bushel ranged from 71 to 95.

'Cobb' Conducts Clam Research Off Northwest Coast

The M/V John N. Cobb returned to Seattle, Wash., on May 10 after a 4-week cooperative clam research cruise by BCF and the Washington State Department of Fisheries. (Ocean Engineering and Resource Assessment Cruise No. 94.)



Cobb Cruise No. 94, Apr. 15-May 10, 1968.

Primary objectives were to (1) develop clam-dredging techniques for clam surveys in coastal waters of Washington and Oregon, (2) determine effectiveness of a modified hydraulic dredge on littleneck and butter clam beds, and (3) determine availability of clams on Alden Bank, Hale Passage, and northeast of Guemes Island in Puget Sound.

Equipment Used

A modified East Coast-type hydraulic surf clam dredge, borrowed from Washington State, was used. It weighs 1,750 pounds and has a 30-inch wide, fixed-depth, cutting blade. Bottom slats were spaced $1\frac{1}{2}$ inches apart, while side and top slats were spaced 2 to $2\frac{1}{2}$ inches apart. The bag consisted of 2-inch diameter hog rings and 5-inch webbing.

A diesel engine supplying 137 continuous hp. at 1,750 r.p.m. was used to drive a centrifugal pump with 16-inch standard impeller. The pump can supply 1,600 gallons per minute at 112 p.s.i. when operated at 1,750 r.p.m. A 6-inch diameter overboard suction line was connected to a foot valve. Connecting the pump and dredge were 320 feet of 6-inch inside diameter hose.

The dredge was often towed with a 300-foot-long, $1\frac{1}{8}$-inch diameter, nylon rope. The dredge was set and retrieved with a $\frac{5}{8}$-inch diameter, 6-conductor, electro-mechanical cable.

A double axis tilt indicator with a range of -45^{o} to $+45^{o}$ was mounted on the dredge and connected to a pilothouse readout by the 6-conductor cable. A 3-wheeled tensiometer remotely indicated cable tension in the pilothouse.

DEVELOPING CLAM-DREDGING TECHNIQUES FOR SAMPLING WASHINGTON-OREGON COAST

The first objective was to test and modify clam-dredging equipment to sample sandy bottom for clams.

Dredge performance was monitored by the tilt indicator and tensiometer and, sometimes, by divers. The tilt indicator, mounted on arm that swung as dredge dug into bottom, indicated depth to which the dredge dug and its sideways tilt. It was usually possible to determine bottom type and hardness by noting dredge performance as shown on tilt indicator. When sideways tilt and digging depth remained constant, crew knew that the dredge was hung up. Divers observed the dredge during 11 tows and made observations in the furrow of 16 tows.

Both the $1\frac{1}{4}$-inch nylon rope and 6-inch hose were wrapped up on the net reel, allowing them to be rapidly set and retrieved.

Results

Initially, the dredge quickly filled with sand. Much less sand was retained by the dredge after these 3 modifications were made: (1) the $3\frac{1}{2}$-inch webbing covering the cage, which quickly became plugged with worm cases, was replaced with $\frac{1}{2}$-inch diameter rods set about $2\frac{1}{2}$-inches apart (center-to-center); (2) the solid digging plate was replaced by a slotted digging plate, allowing sand to be forced through it; and (3) fourteen $\frac{1}{2}$-inch jets directed toward top of dredge cage were installed in aft portion of dredge cage.

The dredge immediately became plugged on clay bottom. No attempt was made to correct this problem. Rocks, which were supposed to drop out an opening behind the cutting blade, were caught in large quantities.

While being set and retrieved, sharp edges on dredge cut into vessel. To prevent further damage to vessel, 3-inch pipe was welded along the side of dredge, and a guard made of 8-inch pipe was welded on the front of dredge.

The dredge frame, cutting blade, washout guard, and manifold proved much too weak and had to be strengthened.

When the slotted digging plate was first used, the dredge continually leaned over on its port side. The dredge usually stayed upright after its towing point was moved down to lowest point possible, the 45^{o} elbow on dredge manifold was replaced with a 90^{o} elbow, and more tow line was let out to reduce size of hose loop behind dredge. The dredge did not work well enough to justify further use. A new dredge, similar to present East Coast hydraulic surf clam dredges, will be designed and built.

Towing Speed

The dredge traveled only 0.4 knot to 0.7 knot when set to dig 15 inches, and about 1,600 gallons of water per minute were

delivered to dredge at 80 p.s.i. A tow rope tension of about 2,600 pounds was maintained. These speeds are much below the 2 to 2½ knots maintained by East Coast commercial clam fishermen.

Suction Hoses and Priming System

Several imperfections were apparent. The deck hose provided insufficient water to quickly fill the pump and suction hose. The foot valve allowed some water to leak out when vessel turned. The 90° swivel elbow could not be brought completely inboard of vessel guard; this made it necessary to take suction hose off when passing through locks and when docking on starboard side.

Vessel Lifting Gear

The dredge was lifted aboard after every tow, using the mast, boom, and hydraulic boom winch. Although this procedure works well in protected waters, it is unsuitable offshore because it allows the dredge to swing dangerously.

On occasions, when dredge picked up heavy load of substrate material, the hydraulic boom winch was unable to lift dredge. A block and tackle then had to be used to lift dredge aboard.

Sorting clams from bottom sediment, shell, and other trash proved time-consuming. A sorting table will be built for future work. Eleven samples per day can be collected with this equipment when no breakdowns occur. Use of a proper sorting table should increase rate to about 15.

When moving from one station to another, a speed of 8 knots was maintained. The hose and dredge were towed just beneath water surface.

Quality of sample

Although the dredge did roughly indicate relative abundance of clams, the present dredging system does not give a good quantitative sample for these reasons: (1) when digging jets are adjusted to hit ahead of cutting blade, clams are sometimes washed under cutting blade, especially on soft sediments; (2) it is difficult to determine distance sampled; (3) the dredge continues to cut a shallow trench when it is winched in; (4) dredge often skips; (5) if long tows are made, dredge fills with subsequent material (including clams) thrown out sides and top; (6) since slats must be kept widely spaced to filter sand, gravel, and mud, many small clams are lost; (7) in some areas, geoducks (very large, edible clams) were available but dredge dug only deep enough to cut off their necks.

Despite these shortcomings, dredge has 2 good features. It samples a large area (30 inches wide and 50 to 500 feet long) and penetrates substrate down to 17 inches.

Geoducks

Despite efforts to avoid catching geoducks, they were abundant in a small area at head of Quartermaster Harbor and over large area in Useless Bay. During 187 minutes of towing, 1,484 geoduck necks and 61 whole geoducks were caught in Useless Bay. Divers reported many necks were left in furrow. Crew encountered average of 0.6 geoduck per square yard, and maximum of 1.5 geoducks per square yard. (These figures include number of necks estimated left behind in furrow.)

EFFECTIVENESS OF MODIFIED HYDRAULIC DREDGE ON LITTLENECK AND BUTTER CLAM BEDS

Dredging efficiency was assessed in Agate Passage, where known clam concentrations exist. The procedure was to dredge 125 to 200 yards, mark beginning and end of haul with marker buoys. Two diver teams (one BCF, the other Washington State) then determined density of clams in 2-square-foot areas in and adjacent to dredge furrow at 25-yard intervals using gold dredges. The divers also noted damaged clams and clams dug out by dredge but not retained by it.

Results

The 2 most numerous clam species were the butter clam (Saxidomus giganteus) and littleneck clam (Protothaca staminea). Catches ranged from 11 to 499 clams (2 bushels) for butter clams, and 4 to 912 clams (1.1 bushels) for littlenecks. The proportion of butter clams retained by dredge to number estimated that should have been caught based on divers density figures, ranged from 4 to 48 percent; overall percentage was only 17 percent. The dredge caught an average of only 9 percent of estimated number of littleneck clams in its path. In the worst tow, it caught only one percent of littleneck clams;

in the best tow, it caught 27 percent. Dredge performance would have been better had shorter tows been made and dredge been properly adjusted.

CONDITION OF SUBSTRATE AND FAUNA AFTER DREDGING

The aftereffects of dredging on substrate and fauna in Agate Passage were investigated by the Washington State divers who examined the tracks of 3 dredge hauls.

Nine Days After Dredging

Track 52 (catch: 499 butter clams, 912 littlenecks, and 13 geoducks). This had filled in somewhat but was still very evident. All littleneck clams and butter clams that were evident along and in this track shortly after dredging had disappeared. There were some empty shells of recently killed clams but no live ones. The uninjured clams apparently had dug back into the substrate. The injured ones, or ones that failed to dig back in were soon consumed by starfish (Pisaster). There was no evidence of any extensive decomposition of dead clams. Live healthy butter clams and littleneck clams were buried in track bottom, apparently little affected by dredge. Many fish (flounders, sole, ratfish) were observed along track. The hardshell clams left exposed by dredging either were eaten by scavengers or had redug back into substrates soon after dredging.

Track 56 (catch: 181 butter clams, 4 littlenecks, and 74 geoducks). This track was made in very soft sand and broken shell substrate. It had changed very little since May 1, when it was made. There were geoducks, whole and injured (mainly siphons clipped off) laying beside and in track. Starfish (Pycnopodia) were eating whole and injured geoducks. Some geoducks in bottom of track, which had siphons clipped, were being attacked by Pycnopodia. The starfish apparently were digesting injured siphons by digging depressions over geoducks and applying their stomachs next to tips of injured siphons. There were large holes in track where dredge apparently stopped its forward motion, allowing jets to dig in. Some holes were 3 feet deep and 5 to 6 feet across. One hole contained 5 injured geoducks laying completely uncovered at bottom of hole. No apparent fouling of substrate by decomposing clams was evident.

Diver Observations 3 Weeks After Dredging

Track 60 (catch: 420 butter clams, 787 littlenecks). The track had changed little since dredging. Test gold dredge holes were still evident along side of and in track itself. Large concentrations of starfish (Pisaster) were still evident and concentrated in track. Apparently, they were still feeding on clams disturbed by dredging. No evidence of problems due to decomposition of clams and other organisms was apparent.

AVAILABILITY OF CLAMS ON ALDEN BANK, IN HALE PASSAGE, AND NORTHEAST OF GUEMES ISLAND

On Alden Bank, 25 tows were made ranging from 4 to 14 fathoms but mostly from 5 to 9 fathoms. Most of the bank was rocky, causing considerable damage to dredge. A 50-acre area containing Humilaria and Saidomus giganteus (butter clam) was found in southwest corner. Eight tows in this area averaged 50 pounds per 3-minute tow. The dredge brought up much potato-sized rock and some shell, gravel, and mud.

Although clams were present in immediately surrounding area, large rocks prevented dredging.

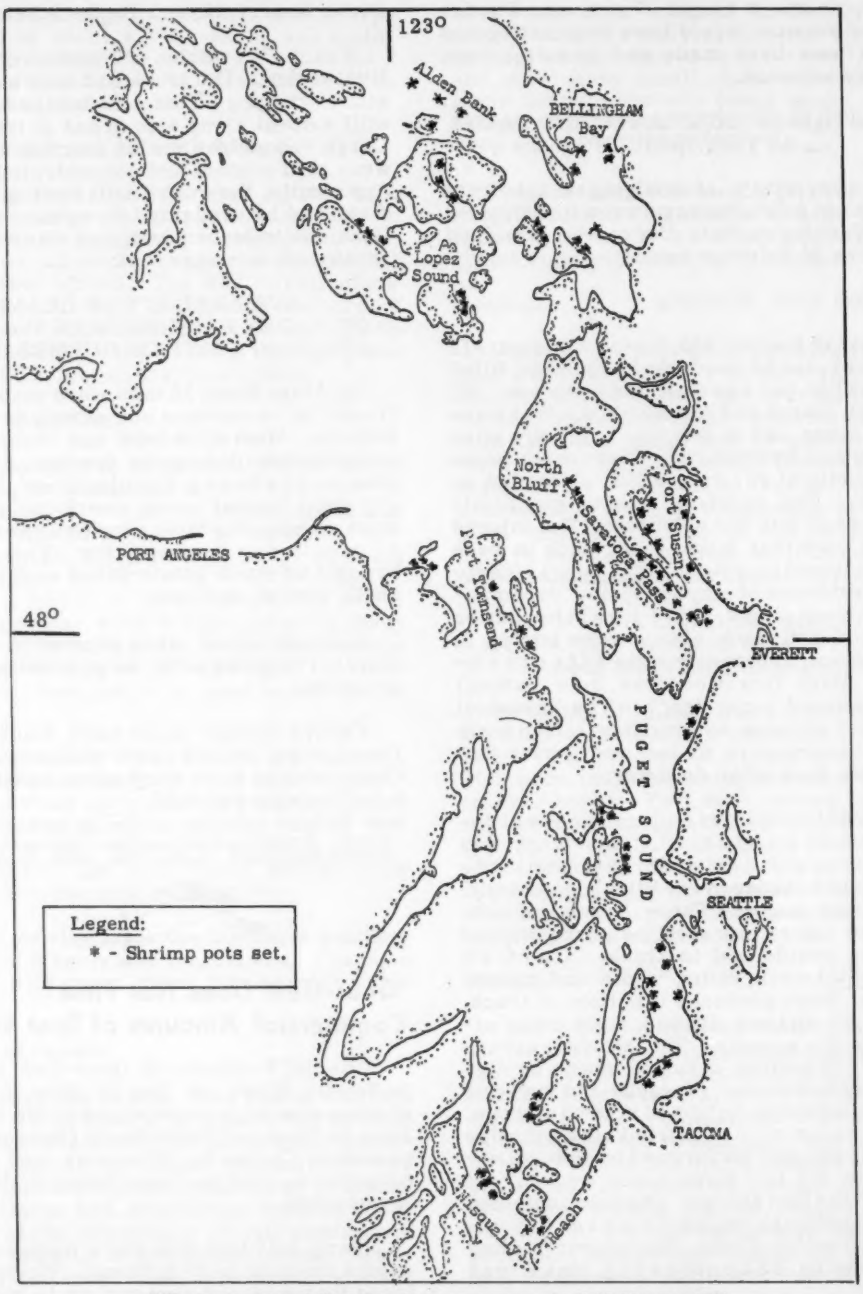
Twelve dredge hauls were made in Hale Passage and northeast of Guemes Island. Clam catches were very poor, ranging from 1 to 72 clams per haul.

Note: For further information contact: Dayton L. Alverson, Base Director, Exploratory Fishing and Gear Research Base, 2725 Montlake Boulevard E., Seattle, Wash. 98102, Phone 583-7729.

'Geor-Gee' Does Not Find Commercial Amounts of Spot Shrimp

The BCF-chartered Geor-Gee returned to Seattle, Wash., on May 31 after 30 days of shrimp-resource assessment in the Strait of Juan de Fuca and Puget Sound (Resource Assessment Cruise 1). The work was done in cooperation with the Puget Sound Gillnetter's Association.

Nearly 2,400 pot sets were made at bottom depths from 12 to 90 fathoms. "No area was found that produced spot shrimp in quantities



BCF-chartered vessel Geor-Gee shrimp assessment, April 29-May 31, 1968.

considered adequate for commercial exploitation." The largest catches were made on the west side of Lopez Island. There, a string of 26 pots set in depths from 19 to 23 fathoms caught 207 spot shrimp and 198 coonstripe shrimp (Pandalus hypsinotus). One pot contained 42 spot shrimp and 2 coonstripe shrimp. A string of 25 pots set in 20 to 25 fathoms adjacent to the above string produced no spot shrimp--but it caught 572 coonstripe shrimp. Average size of the spot shrimp was 14 to the pound, heads-on. Coonstripe shrimp averaged 44 to the pound, heads-on. Additional areas in which fair catches of spot, coonstripe, and pink shrimp (Pandalus jordani) were made included Elger Bay and North Bluff in Saratoga Passage, Post Point and Point Frances in Bellingham Bay and also in Port Susan. Waters of southern Puget Sound produced very small catches of shrimp.

Throughout the survey, incidental catches of various fish and invertebrates were made.

Objectives

The cruise's major objectives were to: (1) determine the distribution and availability of the prawn-sized spot shrimp (Pandalus platyceros) in areas of Puget Sound and adjacent waters--except in Hoods Canal and Elliott Bay, where limited commercial shrimp fisheries exist; (2) evaluate feasibility of establishing new shrimp fisheries that would employ west coast gillnet-trawler-type vessels; and (3) collect biological data on shrimp.

Fishing Gear

Rectangular commercial-type shrimp pots were used. Each pot had a 20-inch by 32-inch by 16-inch framework fabricated from $\frac{3}{8}$-inch steel rod; each pot was covered with #18 thread, $1\frac{1}{2}$-inch mesh nylon webbing. A tunnel about 12 inches deep terminating with a 3-inch entrance was built into each end. Bait containers were made from pint-size, screw-lid, plastic freezer containers. A series of $\frac{1}{16}$-inch holes was drilled into each container. A heavy stainless steel wire, bent to form a tight hook, was fastened to each container to provide a means of hanging it in the center of the pot. Brine-immersed, cut, frozen herring were used as bait.

Methods

The survey was conducted in areas of Puget Sound from Alden Bank on the north to Nisqually Reach on the south (chart). Fishing was restricted primarily to areas where past experience and the environment suggested shrimp might be present.

Each day 80 pots were fished. These were divided into 3 independent strings of 25 to 28 pots. The pots were attached at 10-fathom intervals along a ground line. Whenever possible, strings were set perpendicular to bottom contours in such a manner that a string covered bottom depths from 20 to 90 fathoms. Pot baits were replaced every second day. Normal procedure was to set the strings of pots about midday, allow them to fish overnight, and to haul them the following morning. This resulted in a "soaking" time of about 20 hours.

'Oregon' Explores for Scallops Off Florida

The BCF's R/V Oregon returned to St. Simons Island, Georgia, on June 26 after 17 days of scallop explorations off Florida's east coast. (Cruise 130, 6/10-26/68.) This was the seventh in a series of industrial development cruises to keep an up-to-date check on the Florida east coast calico scallop (Pecten gibbus) grounds.

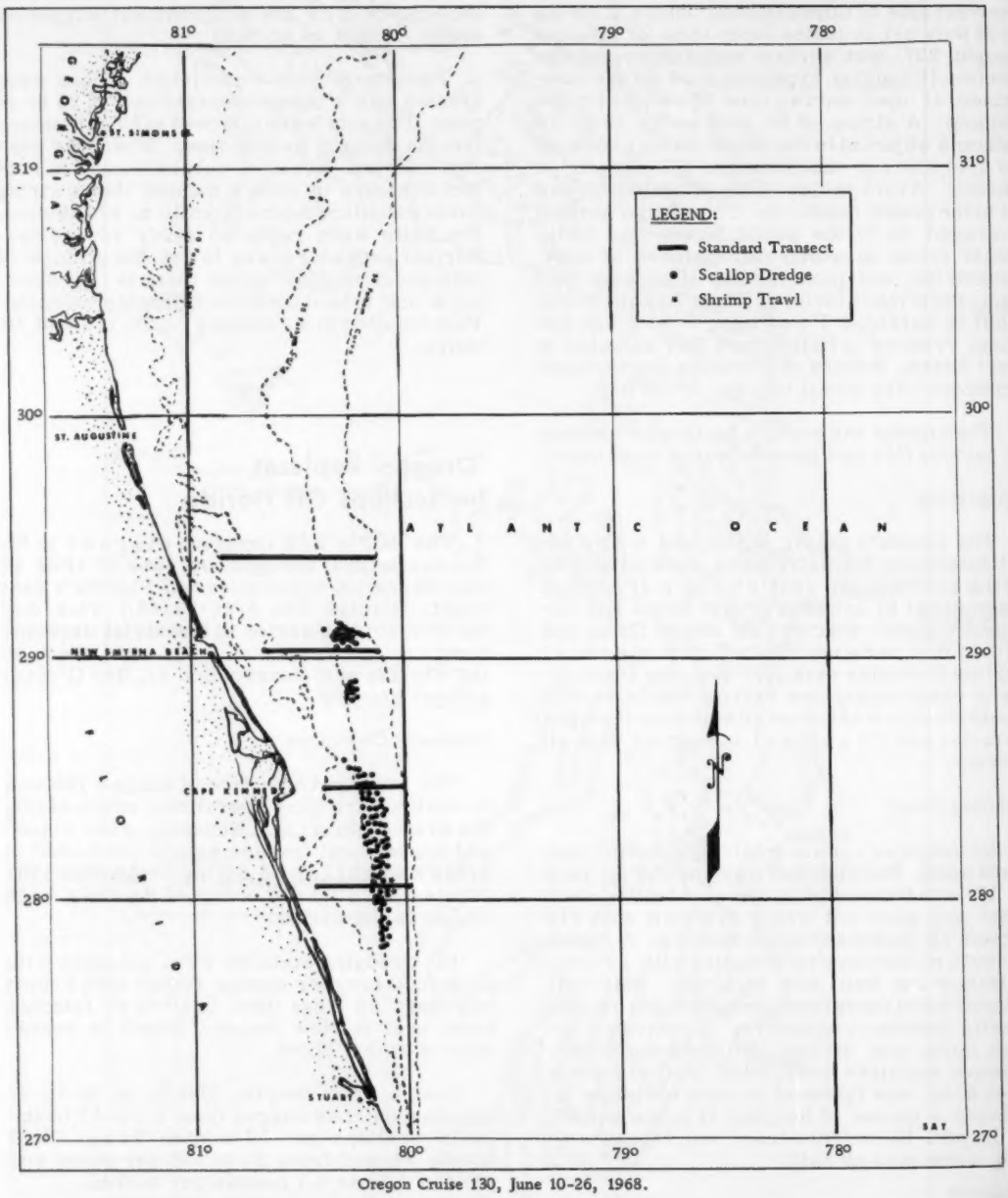
Primary Objective

The principal objective of Cruise 130 was to continue dredging operations, emphasizing the area south of Cape Kennedy. Four standard assessment transects were conducted in areas established during September 1967 (Cruise No. 121) and occupied during each cruise in the series.

181 dredging stations were occupied with an 8-foot tumbler dredge fished with 2-inch bag rings 20 rings deep in 10 to 40 fathoms from east of New Smyrna Beach to northeast of Bethel Shoal.

East of New Smyrna Beach, in 24 to 27 fathoms, catches ranged from 3.1 to 17 bushels of scallops per 30-minute drag. Meat counts ranged from 80 to 105 per pound and yielded 2.75 to 4.1 pounds per bushel.

Northeast of Cape Kennedy, catch rates ranged from 1.9 to 18 bushels per 30-minute



Oregon Cruise 130, June 10-26, 1968.

drag in 24 to 26 fathoms. Counts ranged from 74 to 100 meats per pound and yielded 3 to 3.4 pounds per bushel.

In the southern area, from east of Cocoa Beach to east of Sebastian, catches ranged from 3.6 to 22 bushels per 30-minute drag in 21-24 fathoms. Counts ranged from 116 to 160 meats per pound and yielded 2 to 3.8 pounds per bushel.

Meat Yields

On the average, meat yields north of Cape Kennedy were higher than during May (Cruise 128); south of the Cape, meat yields were slightly lower.

Two days of dredging demonstrations were conducted for industry observers. Fishing information and assistance were provided to vessels in the scallop fishery.

Shrimp

Four nighttime drags were made east of Melbourne, Fla., in 10-23 fathoms with a 65-foot, two-seam shrimp trawl fished on 8-foot chain doors. The drags were made to obtain shrimp for use in evaluating an industry-developed, shipboard shrimp-heading machine. Catches of 21/25 count (heads off) brown and pink shrimp (Penaeus aztecus and P. duorarum) were small; they ranged up to 7 pounds per 60-minute drag.

'Cromwell' Conducts Bottom Trawling Survey Around Hawaii

BCF's research vessel Townsend Cromwell returned from a 2-week cruise to investigate the bottom fishery resources around the Hawaiian Islands. The Cromwell cruised from the island of Hawaii to Necker Island in the Leeward group.

This was the third in a series of cruises designed to investigate the inshore waters to 500 fathoms (3,000 feet) around the major Hawaiian Islands. The investigations are being conducted in cooperation with the Hawaii Institute of Marine Biology, University of Hawaii.

Problems of Fishing Deep

The vessel used primarily Gulf-of-Mexico-type shrimp trawls to investigate the bottom and near-bottom fishery resources. Off Kawaihae, Hawaii, however, she used other fishing gear to try to capture what may have been fishes recorded on fish-finding depth recorders. Here, at 1,200 feet, the crew fished bottom handlines, gill nets and longline gear, and set some fish traps. Fishing at such great depths produced many problems. Much fishing gear was lost while being hauled up. However, the longline gear was retrieved successfully. This gear's catch was entirely a small species of shark not commonly caught around the islands. It is not certain whether these were responsible for the "fish traces" on the depth recorder.

Checked Shrimp Areas

The Cromwell's scientists were interested in any bottom fish or crustacean that offers commercial potentials--but particularly in the Royal Hawaiian shrimp found in significant quantities in certain areas on the series' first cruise. During the cruise, new shrimp grounds were located off Haleiwa in about 50 to 60 fathoms. The bottom there has some rough spots; in 2 of the drags, the shrimp trawl nets were torn.

The ship also investigated the areas where shrimp were found in earlier cruises. In Pailolo Channel, the channel between Maui and Molokai, concentrations of shrimp were still present. Catches up to 19 pounds in a $4\frac{1}{2}$-mile drag were made. Off Molokai's west coast, close to Penguin Banks, where shrimp also had been found, the shrimp were more abundant this time. This was reported by Howard O. Yoshida, who directed scientific activities. In 2 trawl drags of 4 and $4\frac{1}{2}$ miles, 15 and 35 pounds of Royal Hawaiian shrimp were caught.

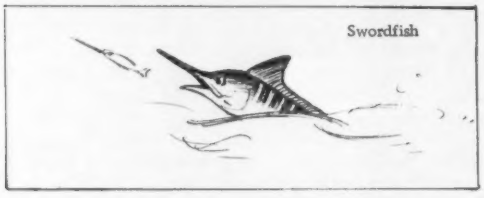
Fishes & Crustaceans Caught

The shrimp trawls also caught fishes and other crustaceans besides shrimp. About 100 species of fishes were caught. Many of these were known only from few specimens before this series of cruises. Of particular interest was the capture of a scorpionfish, known only from a few specimens throughout the world. In one trawl drag south of Honolulu, on bottom more than 2,000 feet deep, 221 specimens

were brought up. Fishery biologist Everet C. Jones, who acted as curator of invertebrates, noted that white crabs and spiny lobsters, which have a ready market in Hawaii, also were caught by the shrimp trawls.

'Miss Behavior' Studies Use of Longline to Capture Swordfish

The Miss Behavior of BCF's La Jolla, Calif., Fishery-Oceanography Center, returned to San Diego on July 1 after a cruise designed to study the use of longline method to capture swordfish (Xiphias gladius). The goal is to improve the efficiency of methods and to enlarge the scope of present fishery. Another major cruise objective was to obtain information on the life history of swordfish. (Swordfish I, June 20-July 1.)



The longline gear was made up of:

Mainline	- $\frac{1}{4}$ inch nylon
Dropper lines	- $\frac{3}{16}$ inch nylon, $3\frac{1}{2}$ fathoms long.
Hooks	- Mustad Shark Hook, 3/0.
Floats	- Oxygen tanks and rubber inner tubes; float lines 5 fathoms.

Dropper lines were attached to the main line by detachable A/K snaps and spaced 12 fathoms apart. Hooks were spliced directly on the dropper lines, without wire leaders. Floats were used between 10-hook units. A radio buoy, a light buoy, and radar reflectors were used to help recover the gear. A pressure depth gauge and a BKG were used to measure depths fished by the gear. Squid (Ommastrephes sp.) was used exclusively as bait. All sets were made at about sunset; hauling usually started at 0600, except when gear was not located until later. All sets were made between the 100- and 1,000-fathom curves.

RESULTS

Set No. 1 - June 22-23. Position latitude 27°31' N., longitude 115°07' W.; surface temperature 15.6° C. 400 hooks. Catch: about 125 blue sharks (Prionace glauca).

Set No. 2 - June 23-24. Position latitude 27°03' N., 114°34' W.; surface temperature 18.0° C. 367 hooks. Catch: one yellowfin tuna (Thunnus albacares, 124 cm.); about 110 blue sharks.

Set No. 3 - June 26-27. Position latitude 23°30' N., longitude 111°10' W.; surface temperature 21.7° C. 268 hooks. Catch: 2 dolphins (Coryphaena hippurus); one scalloped hammerhead shark (Sphyrna lewini); 16 blue sharks.

Set No. 4 - June 27-28. Position latitude 25°02' N., 112°51' W.; surface temperature 19.6° C. 180 hooks. Catch: 9 blue sharks.

Set No. 5 - June 28-29. Position latitude 25°29' N., longitude 113°26' W.; surface temperature 18.7° C. 275 hooks. Catch: one scalloped hammerhead shark; 45 blue sharks. [Note: about one-half the gear (140 hooks) was lost and not recovered.]

About the Operation

The hydraulic powered drum used for hauling and storing the main line performed satisfactorily. Setting time averaged 23.5 minutes per hundred hooks, including time required to change reels. Under normal conditions, hauling time averaged 34 minutes per hundred hooks; tangling of mainline by the large numbers of blue sharks captured caused frequent delays in hauling. The deepest hooks in the 10-hook units fished at a depth of 55-60 meters, according to measurement with a BKG and a depth recorder.

The Swordfish Fishery

Longline catches of swordfish on the U. S. east coast are high during and after the surface harpoon fishery. The highest catches do not necessarily coincide with areas of greatest surface abundance.

The Japanese longline fishery only recently started to operate off Baja California. Most effort has been expended from September through December. Although striped marlin

was the principal species sought, many swordfish also were caught. A small percentage of longline sets was made specifically to catch swordfish--i.e., night fishing with squid as bait, and modification of gear to fish shallower. The catch distribution is thought to be associated with complex subsurface thermal structures. Data from the Pacific coast is insufficient to support or negate this hypothesis. However, surface fish are known to be present off Baja California in June; one was sighted.

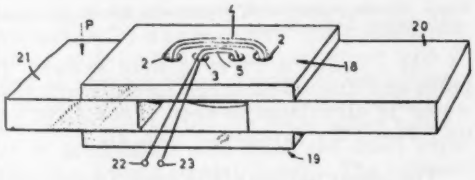
The Miss Behavior scientists said: "No explanations can be offered for our failure to encounter subsurface swordfish during our cruise. As far as we know, our effort represents the first time that longline swordfish gear has been used off Baja California in the month of June."

They add: "A few modifications would greatly increase the efficiency of the operation. Specifically, a larger reel and stand, capable of holding all the mainline, would make it possible to work the gear with a minimum of 3 or 4 men."

REVERSING A SONAR PRINCIPLE

When a piece of iron or other ferromagnetic material is placed in a strong magnetic field, it is deformed. This principle, called magnetostriction, is used in sonar, where a varying magnetic field causes a transducer to vibrate, causing sound waves in the water.

An invention patented recently turns the principle around, and measures force, which causes the iron to change shape, by the change in magnetic field. The output is an electric current, making the device useful for automatic control situations.



In the new device, patented by a Swedish inventor, Olof W. Ohlsson, four holes are bored in the ferromagnetic block--two for a magnetizing wire and two for a measuring wire. An electric current in the magnetizing circuit causes a voltage to be induced in the measuring wire; but this measured voltage depends on the magnetic qualities of the material--its permeability.

If a force is applied to the material, its permeability changes, and the measured voltage changes with it.

Inventor Ohlsson found that by placing the two holes for the measuring circuit in between the holes for the magnetizing wire, the induced magnetic field had its greatest effect, making the device more sensitive. (Reprinted with permission form "Science News," weekly summary of current science, copyrighted 1966 by Science Service, Inc.)

ARTICLES

THE DUNGENESS CRAB FISHERY Around Kodiak, Alaska

By Robert M. Meyer*

Alaska seiners and power barges form the bulk of the fleet that fishes for Dungeness crabs in Kodiak waters from May to October. Crews normally number three men who may set, pull, and reset over ten 30-pot strings a day in shallow, near-shore waters. The pots are baited with herring, clams, or squid. As each pot is pulled, the catch is placed in tanks filled with circulating sea water to insure live delivery to the processing plants. The crabs are usually butchered, cooked, and frozen at the plant and are shipped south for further processing. Some of the better crabs are processed whole.

Dungeness crabs are abundant in the waters surrounding Kodiak Island. The fishery usually is conducted in bays around the island and along the mainland side of Shelikof Strait. But in 1967, fishing was concentrated on the rich grounds off the Trinity Islands just south of Kodiak Island; more than 4 million pounds were harvested there.

In 1966, because of lack of effort, only 300,000 pounds of Dungeness crabs had been taken on the Trinity Islands grounds; in 1965, 2 million pounds were harvested.

Weather Controls Fishery

The fishery around Kodiak Island is controlled by weather, rather than by regulations, because it is carried out in shallow water--5 to 20 fathoms. Fishermen must wait for the passing of the winter storms before they set their crab pots; otherwise, the storms would sweep the pots away or bury them in the sand. A few fishermen begin prospecting for crabs about the first of May and, by month's end, fishing is generally in full swing. The peak is reached in July. In some areas, it may continue until September or October, when fall storms force the boats to leave the fishing grounds.

VESSELS AND GEAR USED

Two types of vessels are used in the Dungeness crab fishery around Kodiak Island--Alaska salmon seiners (fig. 1) and power barges.

Fig. 1 - Alaska salmon seiner converted to fish for Dungeness crabs around Kodiak Island.

The seiners carry 3-man crews. The holds are fitted with tanks through which sea water is circulated to keep crabs alive until they reach the processor (fig. 2).

The power barges also carry 3-man crews and are fitted with sea-water tanks. Currently, they are the most popular vessels for fishing crabs in western Alaska waters because they can hold more crabs, accommodate more gear, and fish in more adverse conditions than the smaller seiners. The barges are about 87 feet long; their barge size makes it profitable to run the 24 or even 36 hours to the distant crab grounds of Chirikof Island

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Fig. 2 - Dungeness crabs in tank filled with circulating sea water.

Fig. 3 - Dungeness crab pots (40 inches in diameter) stacked on deck of power barge.

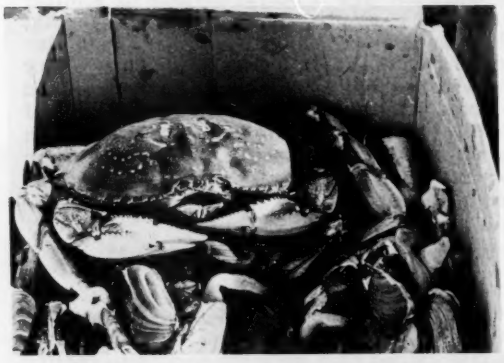

Fig. 4 - Dungeness crabs in box of razor clams. The clams are used as bait in the crab pots.

and Chignik Bay. In 5 trips in June 1967, for example, one barge brought over 300,000 pounds of crabs into Kodiak. This was a greater catch than the combined catch of all other Dungeness crab boats fishing in the area during June.

The principal gear in the Dungeness crab fishery is a round pot. The pots are 42, 48, or 60 inches in diameter. They are constructed of $\frac{3}{4}$-inch round steel stock with 2 pieces of $1\frac{1}{2}$-inch stock welded to the bottom for ballast (fig. 3). The pot frame is wrapped with rubber strips cut from inner tubes. Then it is covered with stainless steel wire woven in a 4-inch stretch mesh. The rubber insulator between the stainless steel mesh and the iron of the pot frame prevents disintegration by electrolysis. Each pot contains a 4-inch escape ring, and two 8- by 4-inch oval tunnels with triggers that close the tunnels so the large crabs cannot escape. A small ring, generally welded to one pot frame member near the top of the pot, allows sublegal size crabs to escape. The crabs are removed and the bait cans changed through a door on the top of the pot. This door is made of a stainless steel rod one-fourth to three-eighths of an inch in diameter. The door is hinged at each end and locked in the closed position with rubber straps and hooks.

The pots are baited with razor clams (fig. 4), squid, or herring that are kept frozen on board the boat and thawed just before use. Razor clams are crushed before being put into the bait can; American squid are used whole; the larger Japanese squid are cut into five or 10 pieces; and herring are cut into pieces 1 or 2 inches long. The bait is held in stainless steel louvered bait cans (fig. 5) 7 inches in diameter and 4 inches deep. They have hinged tops and are attached inside each pot with stainless steel hooks and rubber straps.

Fig. 5 - Crewman attaching bait can in Dungeness crab pot (60 inches in diameter).

Each pot has a polypropylene or similar line with a plastic foam buoy attached (fig. 5). The line is 10 to 20 fathoms long, depending on the depth to be fished. The buoy is 18 inches long by 4 inches in diameter and tapered at the bottom end to reduce chances of fouling by kelp. The buoys and lines must both be dipped periodically in a chlorine solution to remove fouling organisms, primarily algae and hydrozoans.

METHOD OF FISHING

Just before the fishing gear is set, the skipper selects a course and sets the vessel's autopilot. It is important that the boat be maintained on a straight course to facilitate the recovery of pots in rough or foggy weather. As the setting of gear begins, the buoy line and buoy of the first pot and a colored float used to mark the end of the string of pots are trailed behind the boat. At word from the skipper, the first pot is pushed overboard. The next pot and its line and buoy are carried to the rail. The process is repeated until the last pot of the string, also marked with a colored float, is set. A string may contain 30 to 60 pots. Each boat fishes several strings. These usually are set parallel to each other, and approximately parallel to the beach in 5 to 20 fathoms.

An efficient crew can lift and reset over 300 pots in a 10-hour day. In good weather, 2 deck hands can pick and reset more than 60 pots in an hour. To attain this rate, an assembly-line approach must be used in handling the gear. The boat is brought alongside the buoy to be retrieved. The line is brought on board with a boat hook (fig. 6). It is put in a hydraulic power block mounted on the end of a boom (fig. 7). The boom is lowered so the line can be set in the block, and then is raised so the pot can be swung aboard the boat (fig. 8, facing p. 1) and emptied into the sorting box (fig. 9). One man hauls the pot by keeping a strain on the line, while the other man fills a bait can and sorts the previous catch. After the pot is aboard, the catch

Fig. 6 - Crab pot buoy and line being hooked by crewman in preparation for hauling pot aboard. Plastic garbage can shown holds chlorine solution in which buoy and line are dipped to remove fouling organisms.

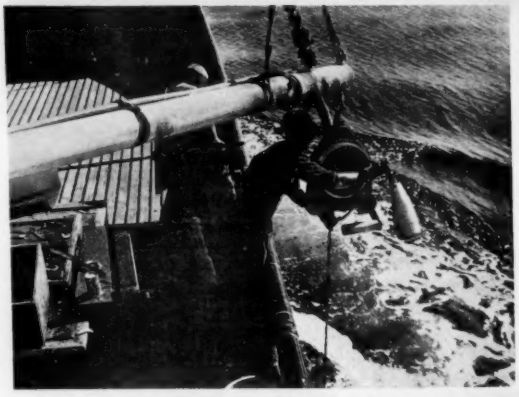

Fig. 7 - Crewman placing line attached to crab pot on the power block so pot can be hauled aboard.

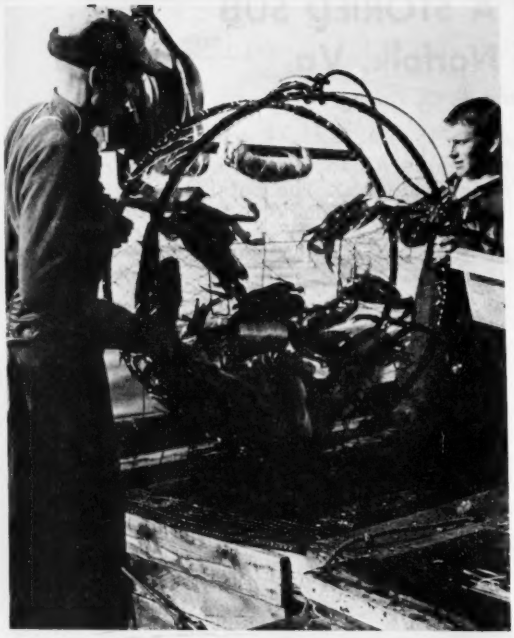

Fig. 9 - Crewman emptying crab pot (40 inches in diameter) into sorting box.

is removed and the bait can be exchanged. Dungeness crabs are put into the sea-water tank, and fish, octopus, and king crab are thrown overboard. The pot is pushed overboard about 75 feet before the next buoy is reached. The boat does not stop at each pot; the men must haul the pots while the boat is underway at a continuous speed of about 2 knots (fig. 10). Because the boats usually work into the wind, they must, upon reaching the end of a string, run to the opposite end of the next string. This break gives the crew a chance to clean up and rest before starting the next string of pots.

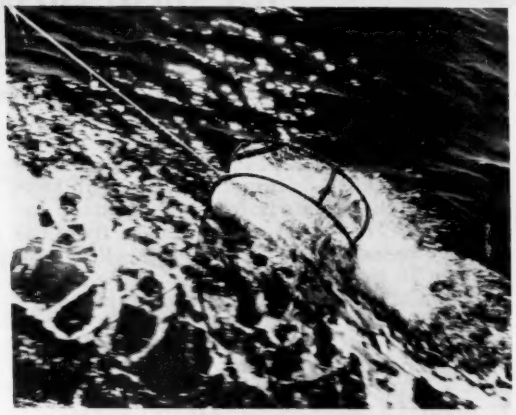

Fig. 10 - Crab pot (40 inches in diameter) surfacing to be hauled aboard power barge. Vessel is traveling at about 2 knots.

PROCESSING METHODS

Crabs are processed in one of two ways. The first and most common method is to butcher and clean the live crab and cook the remaining body and leg sections in boiling water for 12 to 15 minutes. The sections are then frozen, glazed, packed, and shipped south, where they are thawed and the meat removed for canning.

At some processing plants, the largest and best-appearing crabs are prepared for the whole-crab market. They are cooked whole for 25 to 28 minutes, cooled, the shells cleaned by hand, packaged one to a paper bag, and shipped south.

THE VIEW FROM A STORIED SUB
The 'Alvin' Off Norfolk, Va.

By R. L. Edwards* and K. O. Emery**

On July 17 and 18, 1967, the authors made 2 dives in DSRV "Alvin," the research submarine of the Woods Hole Oceanographic Institution. The dives were made from the support vessel "Lulu" off Norfolk, Virginia, in 20 to 25 fathoms. During each dive, which lasted nearly 7 hours, we observed closely a series of underwater ridges and their fauna. These were the first dives for both of us and we were not disappointed.

Alvin is a deep-diving research vessel designed specifically for oceanographic research. The funds for construction and operation were provided by the Office of Naval Research. The Bureau of Ships of the U. S. Navy assisted in preparing performance specifications. The Applied Sciences Division of Litton Industries designed and built the sub.

Shape of the Sub

At the surface, Alvin draws 7 feet. It is 23 feet long, has an 8-foot beam, and displaces 15 tons. Submerged, it has a range of 5 miles and cruises at a little more than 1 knot, with a top speed of about 1.5 knots. Its design operating depth is 6,000 feet, where it has a safety factor of more than two. The crew, a pilot and 2 observers, has 4 viewing ports to look through--to see ahead, on either side, and directly beneath the vehicle. The passenger sphere is 7 feet in diameter. It is made of high-strength, 1.33-inch-thick steel. The life-support systems provide for an endurance of 24 hours or more.

Alvin is not large inside. After several hours with a pilot and 2 observers aboard, things begin to feel a bit cramped. The discomforts are minor, however, compared with all the interesting things to be observed outside. And, to help the observers work, the sub is equipped with a tape recorder, television camera, and 2 automatic 35-mm. cameras. Also, each observer can carry a hand-held camera loaded either with color or black-and-white film. The outside cameras produce stereographic pairs and are actuated by a button--or can be set to operate automatically at a desired interval. A box lunch and coffee are provided if the dive is to last long enough.

A Storied Sub

The sub already has made quite a name for itself. During February to April 1966, it made 34 dives off Palomares, Spain, in the search for a lost hydrogen bomb. Alvin found it in 2,800 feet of water on 2 occasions and played a vital role in its recovery.

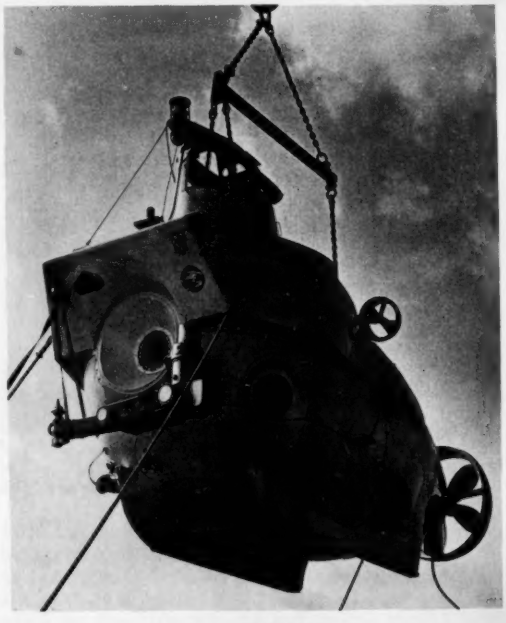

Fig. 1 - DSRV Alvin.

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Note: Contribution No. 2142, Woods Hole Oceanographic Institution.

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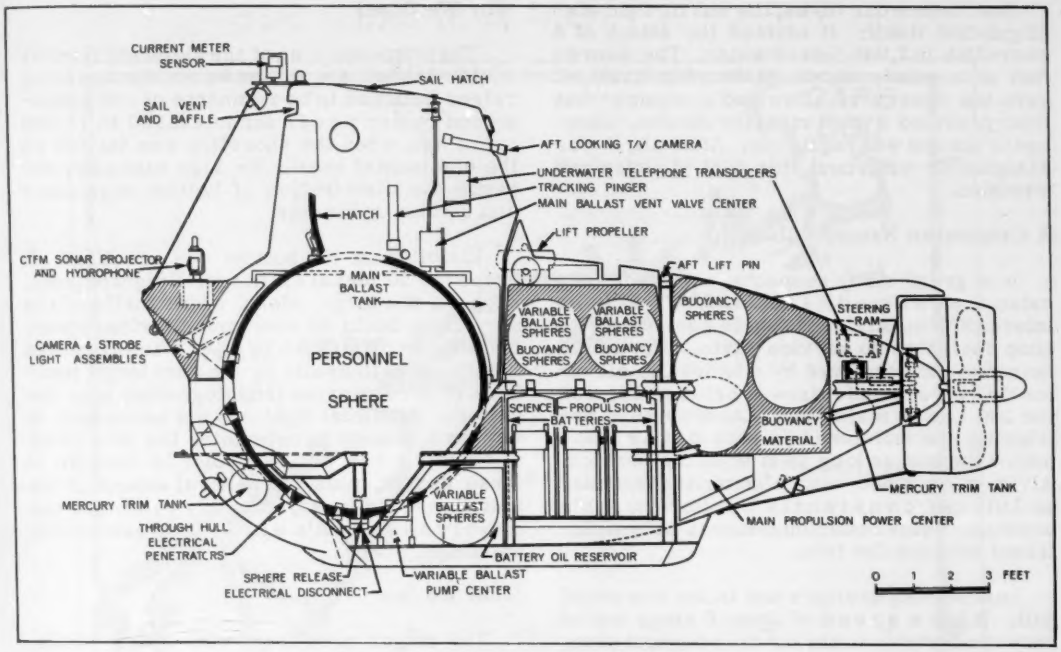

Fig. 2 - Schematic cross-section of DSRV Alvin.

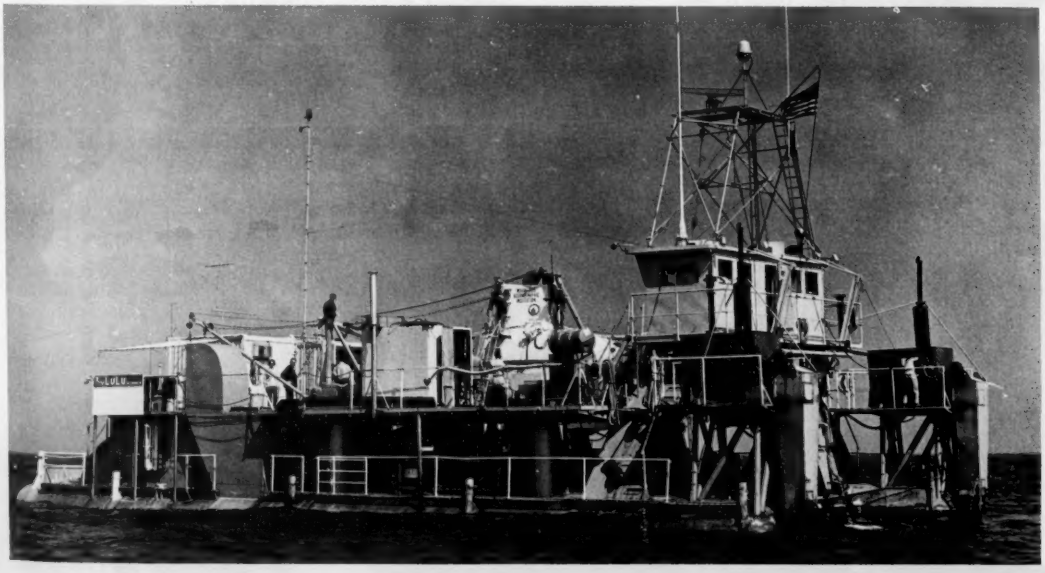

Fig. 3 - Alvin's mothership, Lulu, is a catamaran. Alvin is launched and retrieved from a cable suspended between the hulls. In this picture, Alvin has been raised to working deck.

Just before our dives, the sub further distinguished itself: it blunted the attack of a swordfish in 2,000 feet of water. The swordfish succeeded only in destroying itself. It gave the observers a few bad moments--but later provided a good meal for others. Damage to the sub was negligible. After all, it was designed to withstand this sort of undesired attention.

A Catamaran Named Lulu

In a great many respects, a 96-foot-long catamaran named "Lulu" (DSRVT-1) is as interesting as Alvin. Lulu is equipped with shop facilities to service Alvin. The sub is launched and retrieved by a hydraulic elevator that lowers and raises it between the water and Lulu's main deck. Launching and retrieving are monitored by skin divers who follow the sub as long as it is at the surface. Alvin is equipped with a sonar transponder so Lulu can constantly monitor the sub's position. Voice communication is also maintained between the two.

Lulu's living quarters are in its starboard hull. It has a speed of about 6 knots and is very comfortable in any but the roughest seas. Launching is not attempted when the wind exceeds force 3, or the waves are higher, or might become higher, than 5 feet.

Why We Dived

The prime purpose of the dives off Norfolk was to investigate the nature of submarine ridges believed to be remnants of old beaches and oyster reefs formed 8,000 to 10,000 years ago, when the shoreline was far out on the continental shelf. We also wished to observe the distribution of bottom organisms and bottom sediments.

Visibility at the bottom was excellent. It exceeded 50 feet at all times. Bright objects, such as the large, clean, white shells of the surf clam could be seen much farther away, but only as diffuse objects. Visibility was restricted principally by the very large numbers of arrowworms (chaetognaths) near the bottom. Artificial light was not necessary at any time, except to determine the true color of objects. The bluish color of sunlight at these depths, plus the general aspect of the bottom and its fauna, strongly reminded one of Salvador Dali's early impressionistic paintings.

What We Saw

The ridges were found with oyster shells, as expected. They extended north-south, approximately parallel with the edge of the continental shelf. Ranging up to about 30 feet

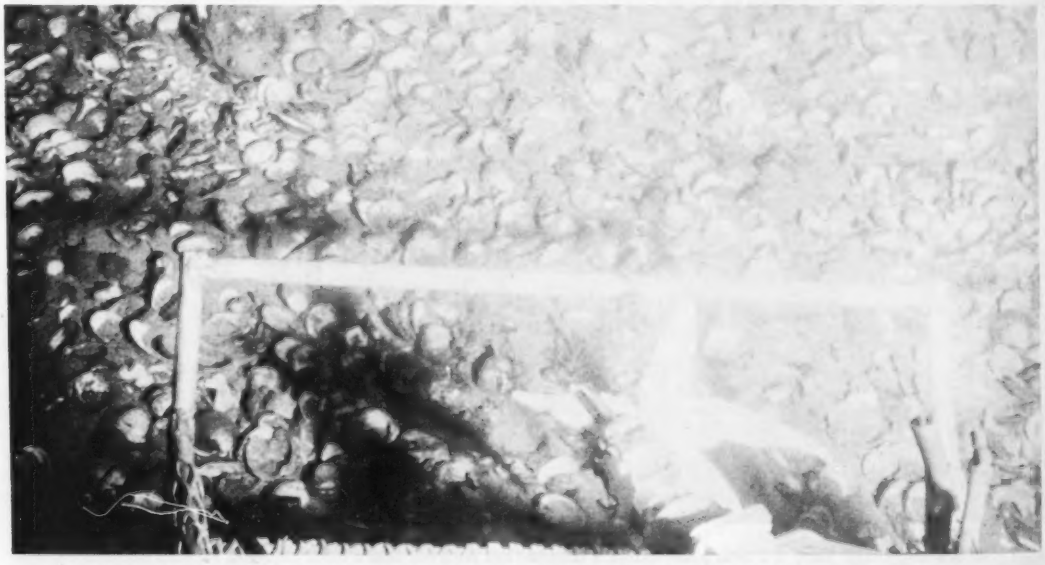

Fig. 4 - An ocean quahog graveyard. These are dead shells. It is possible they may overlie a dense bed of living animals.

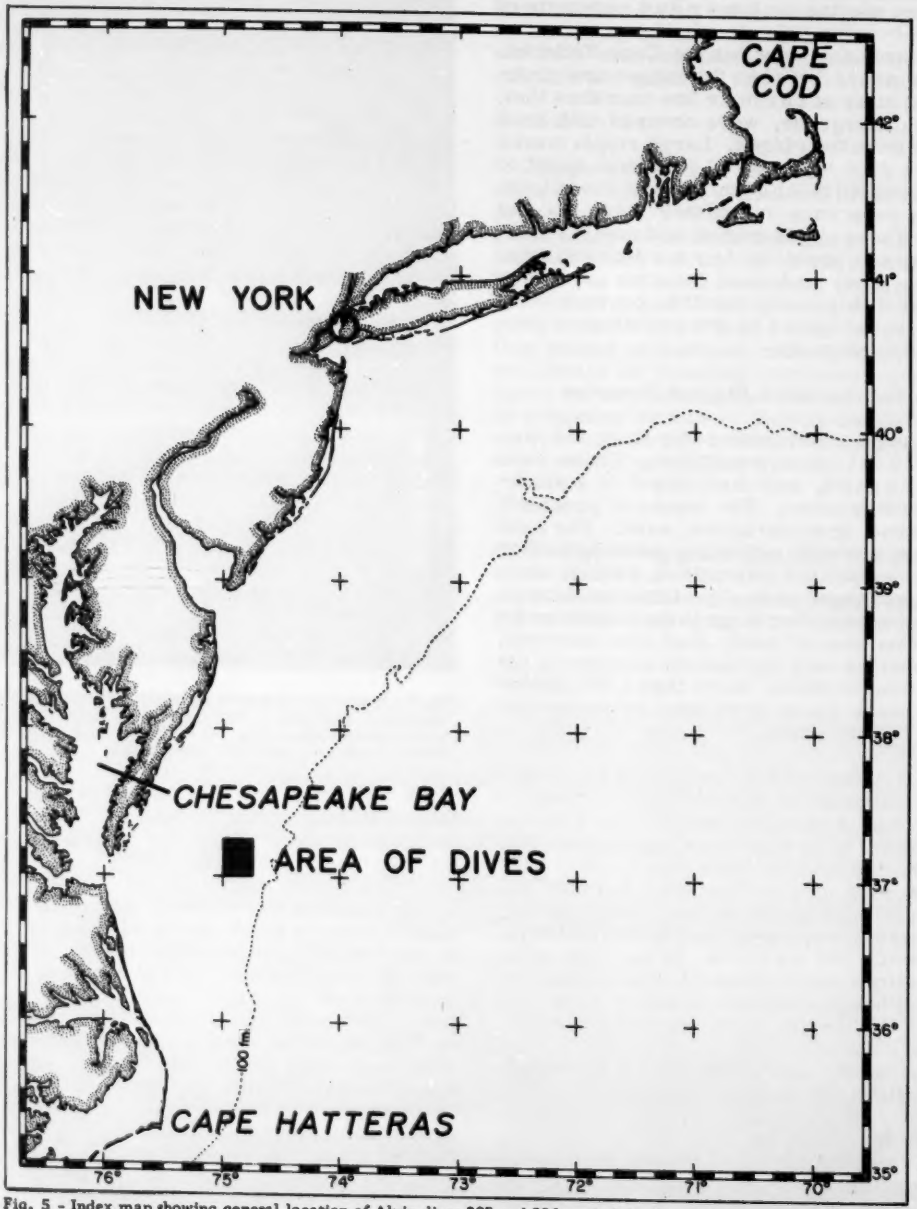

Fig. 5 - Index map showing general location of Alvin dives 205 and 206 made July 17 and 18 on the continental shelf.

above the otherwise nearly flat shelf, they consist mostly of loose coarse sand. Probably they are the submerged remnants of former barrier islands similar to the barrier islands that now outline Cape Hatteras. The flat areas between the ridges are probably the sites of former low marshes that, after submergence, were covered with sand washed from the ridges. Large ripple marks (about 1 foot high and 10 feet from crest to crest) covered much of the tops of the ridges, but they were rare in the intervening low flat areas. These ripple marks, and some smaller ones, are probably formed by seasonal storms. They had been inactive for a long time, probably many months, because their shapes were blurred by the activities of bottom-living animals.

Bottom Communities Biggest Surprise

Our biggest surprise came from the nature of bottom communities. These were many, varied, and distributed in a patchwork-quilt manner. The bottom generally was coarse, grayish-brown, sand. The sand was iron stained, indicating great age. For reasons we did not understand, bottom communities changed radically without an accompanying observable change in the bottom sediment. One area of sandy mud was observed, made obvious only by radical changes in the animal communities. More than 1,000 photographs were taken in at least 10 distinctive bottom communities.

The 2 dives were separated by about 5 miles. Although no significant change in bottom type was noted between the 2 areas, differences in fauna were numerous. For example, the spotted hake was the dominant species seen on the first dive, but only red hake were seen on the second. Many mating cancer crabs were seen during the first dive, none during the second. In the first area, sea scallops were abundant in their shallow holes; although many sea scallops were also seen in the second area, few had dug holes.

Some of the more interesting biological observations, by species, follow.

Red and Spotted Hake

As expected from previous research with the underwater camera, red hake (Urophycis chuss) were almost always closely associated with other objects on the bottom. They were seen frequently with sea scallops, both alive and dead (shells). The larger fish tended to stay close to objects, the smaller to get in or under such things as shells, sponges, or litter.

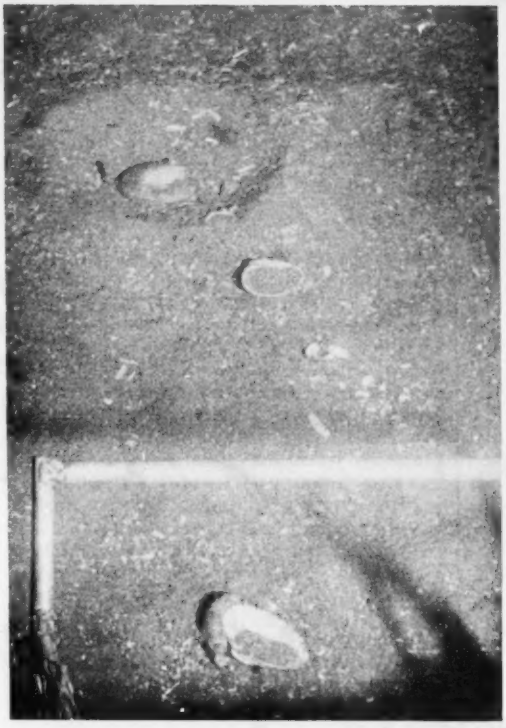

Fig. 6 - A spotted hake in lower part of picture is cuddled around the shell of a surf clam. Both spotted hake and red hake were seen in such an association. At the top, a large sea scallop is sitting in a typical crater-like hole it made.

To stabilize the Alvin, it was made sufficiently heavy to touch gently on the bottom as it was being driven into the current. As a result, the immediate surface of the bottom was smoothed as the sub moved along. Several times hake were observed swimming quickly to this smoothed area, searching actively with their long pelvic fins for food, heading downstream with the current. When something edible was detected, the fish quickly turned into the current, and then apparently located the object visually and ate it.

The spotted hake (U. regius) behaved in much the same manner but seemed to associate less with other objects on the bottom. One even swam into the cow-catcherlike

collecting bin on the front of Alvin and stayed there for more than an hour. Most fish paid little attention to the sub until it came within about 2 feet. Then they tended to move away without any panic or haste.

Silver Hake

Echo-sounder traces usually attributed to silver hake (Merluccius bilinearis) were abundant in midwater before the second dive. When we submerged at 11 a.m., these traces were nearing the bottom. When the sub reached the bottom, small groups of silver hake were seen moving along slowly, mostly within 1 fathom or so of the bottom. Within an hour, at about noon, no fish were observed off the bottom. Single fish only were seen, resting quietly in shallow depressions. They remained that way throughout the dive, which ended at 6 p.m.

There is nothing silver about silver hake in their natural environment. They looked very much like blotched tomcod. Their general color was brownish, with 5 to 7 irregular, darker, vertical bars. All the fins, but especially the 2 dorsal fins, had a luminescent greenish border. When disturbed by the sub, they swam away slowly to another shallow depression and settled down again. The only feeding observed took place at the time of descent, when a few fish appeared to be biting at objects on the bottom. This action was associated occasionally with a quick twist, when the fish "flashed" brightly.

Cancer Crabs

Large cancer crabs (Cancer irroratus) were common. They appeared to have a carapace width of 6 to 8 inches. One occurred about every 30 to 50 feet of travel. Of all the animals seen, the cancer crabs reacted most strongly to the sub's presence. Most of those not buried began to move away when the sub got within 15 or 20 feet. And, once moving, they tended to continue moving away beyond the limits of visibility. Others, for a time, faced the sub with claws raised and spread in a fighting stance. During the first dive, most of the larger crabs, obviously females, were carrying smaller males.

Fourspot Flounder

Fourspot flounders (Paralichthys oblongus) were numerous--one about every 100 feet or so of travel. Two size groups were apparent, the smaller averaging 3 to 5 inches long, the

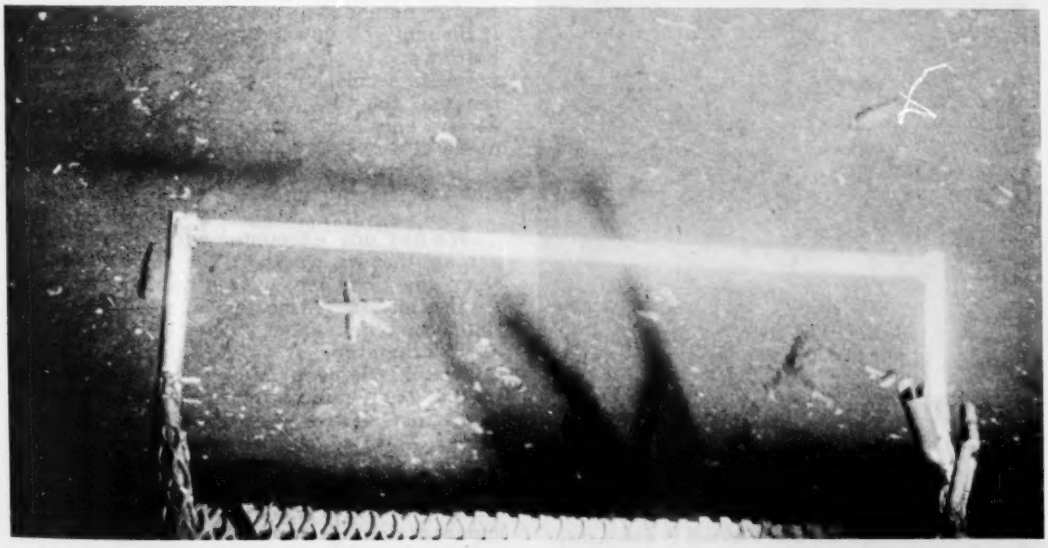

Fig. 7 - Small silver hake resting on the bottom. About noon these fish were seen in midwater; shortly afterward, they settled to the bottom, where they remained in small depressions for the rest of the day.

larger about 10 to 12 inches. They were resting quietly in the bottom, but they were not covered or buried. No buried flounders were seen. A very large number of much smaller flounders, about 1 inch long, also were seen. These small fish occurred every 3 feet or so, and appeared to be fluke (Paralichthys dentatus), not fourspot flounders.

Sea Scallop

Small sea scallops (Placopecten magellanicus), most much less than 1 inch in diameter, were very abundant. Often disturbed by the sub, fish, and crabs, they were seen flitting constantly through the water, usually only a foot or so above the bottom. They moved 3 to 6 feet when disturbed and reminded us very much of small tired butterflies.

In addition to these small scallops, 2 other size groups were apparent. Large scallops, 7 to 10 inches in diameter, appeared at regular and frequent intervals. Medium-sized individuals, about 4 inches in diameter, were infrequent. None of the large scallops showed any tendency to "fly," but the medium-sized individuals were as mobile as the small ones and took off at the slightest provocation.

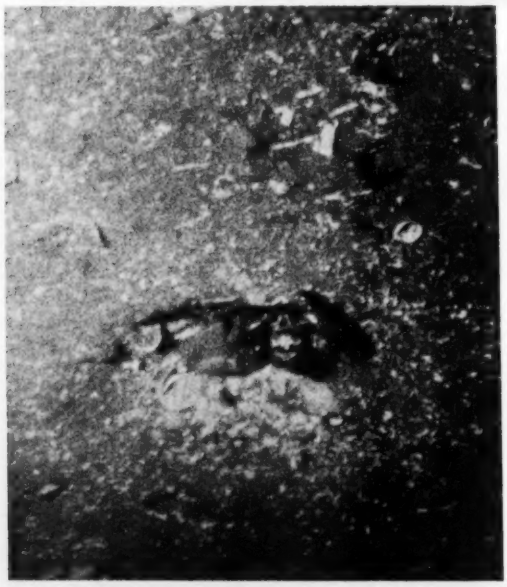

Fig. 8 - Lobster sharing a hole made in the sand by a sea scallop. The hole is about 15 inches in diameter and 5 inches deep.

Large Sea Scallops

In the first area, very large sea scallops occurred every 20 feet or so. Several were closely observed and judged to be between 10 and 13 years of age. Every large scallop occupied a shallow hold about twice its own diameter. The holes did not have elevated rims and were more than deep enough to completely contain the inhabitant. Scallops were seen turning around in their holds, blowing detritus and fine material out. Even large scallops couldn't "puff" hard enough to blow heavier objects out of their holes, however, and thus many holes were lined with larger shell fragments. In some areas, the sea scallops had clean shells; in others, their shells were incrusted with sponges and other organisms. We noticed that the incrusting organisms were not limited to living scallops, but occurred as well on empty shells and other detritus in the same area.

Surf Clams

Surf clams (Spisula solidissima) were abundant, judging from the very large numbers of shells we saw. There was no visible evidence of this species living within the sediments. One large specimen (about 6 inches wide) was seen "leaping" across the bottom. It had obviously been disturbed by something and was beating a hasty retreat. The clam rapidly extended its foot in such a manner that it thrust itself upward about 18 inches off the bottom and fell to the bottom 2 or 3 feet away from its starting point. At its maximum extension, the foot was about $1\frac{1}{2}$ times as long as the shell. The foot was retracted much more slowly than it was extended.

And the "Sea Monster"

We had one encounter with a strange organism that we dubbed the "Sea Monster." Near the bottom, during the first descent, Alvin pilot Marvin McCamis called our attention to an object about 25 feet long and 6 inches in diameter. It was undulating slowly in midwater. He secured our sea monster with the sub's mechanical hand and brought it close to the port. It was a chain of unusually large salps. The individual salps were about 5 inches long, paired, and aggregated into a long chain of pairs. We dragged the chain along with us for more than an hour without apparent damage to it. We released it when we needed the claw to pick up some rocks.

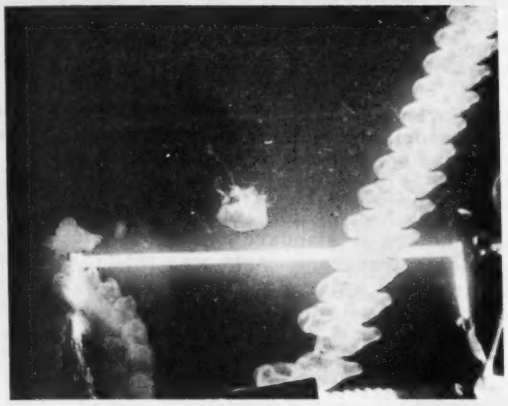

Fig. 9 - "Sea monster" and jellyfish. The sea monster is a giant salp common in these waters but seldom seen in chains this long.

Fortunately, we had sufficiently good photographs to identify the organism as Salpa vagina, a species common in these latitudes.

Sub's Value in Research

What use does a sub have in fishery research? No one expected that we would have even half the visibility we enjoyed on these dives. Sometimes we observed the behavior of fishes from considerable distances. It was apparent that all species paid little if any attention to the sub until it got very close. It is reasonable to suppose that worthwhile observations could be made on most or all groundfish species. Some possibilities include a study of haddock spawning behavior, territorialism of redfish, and the diurnal vertical migrations of hake.

One couldn't miss the "butterflies." Sea scallops up to 3 or 4 inches are extraordinarily mobile and, even under conditions of limited visibility, they could easily be seen. A sub would make the ecologic study of the sea scallop a comparatively easy matter, and surveys of sea scallop concentrations for the commercial fleet would be practical and feasible.

Over the years, all biologists who have studied the early life history of the haddock have noted that small haddock tend to be more abundant in those areas where the jellyfish Cyanea also was abundant. On our dives, Cyanea was seen frequently near the bottom. Small fish, apparently all gadids, were associated with some of them. Direct observations on the relationship between haddock and Cyanea could readily be studied from a sub.

Track of the Otter Trawl

Several times during our 2 dives, we observed what must have been the "tracks" of otter trawls and scallop dredges on the bottom. Studies of the direct effects of trawls and dredges on the bottom could be carried out with comparative ease in a sub. Until much faster vehicles are available, however, there is little justification for using one to observe the action of trawl gear directly. Even with maximum visibility, relatively great speed and maneuverability would be required to keep up with such gear--and to avoid the real possibility of accidental entanglement.

Just as the present generation of submersibles has only limited value for direct observation of moving trawl gear, so operations also would be difficult in strong currents, especially along some parts of the New England coast.

Alvin was made sufficiently "heavy" on our dives to minimize the effect of the currents (up to a half knot) by just setting it on the bottom. Control was excellent so long as we were heading upcurrent. During maneuvers, such as turning around to get a second look at some object, the current could be troublesome. Control of these vehicles requires a trained and delicate touch.

THE LATE-SUMMER WATERS OF THE GULF OF MEXICO

By Reed S. Armstrong* and John R. Grady*

After being chased by two hurricanes, "Beulah" and "Fern", BCF's R/V "Geronimo" returned to its home port of Galveston, Texas, on Oct. 8, 1967. It had finished what probably was the most comprehensive hydrographic survey of a sea ever made.

Cruise 16, which began August 14, was the second in a series of hydrographic surveys of the Gulf of Mexico. Each cruise is designed to cover all waters of the Gulf with the goals of describing the sea and determining how the waters and currents change in time.

We occupied 151 hydrographic stations (fig. 1) using Nansen bottles with reversing thermometers at standard depths. A total of 298 bathythermograph casts was made; samples of surface water for salinity determinations were drawn at each lowering. Salinity and

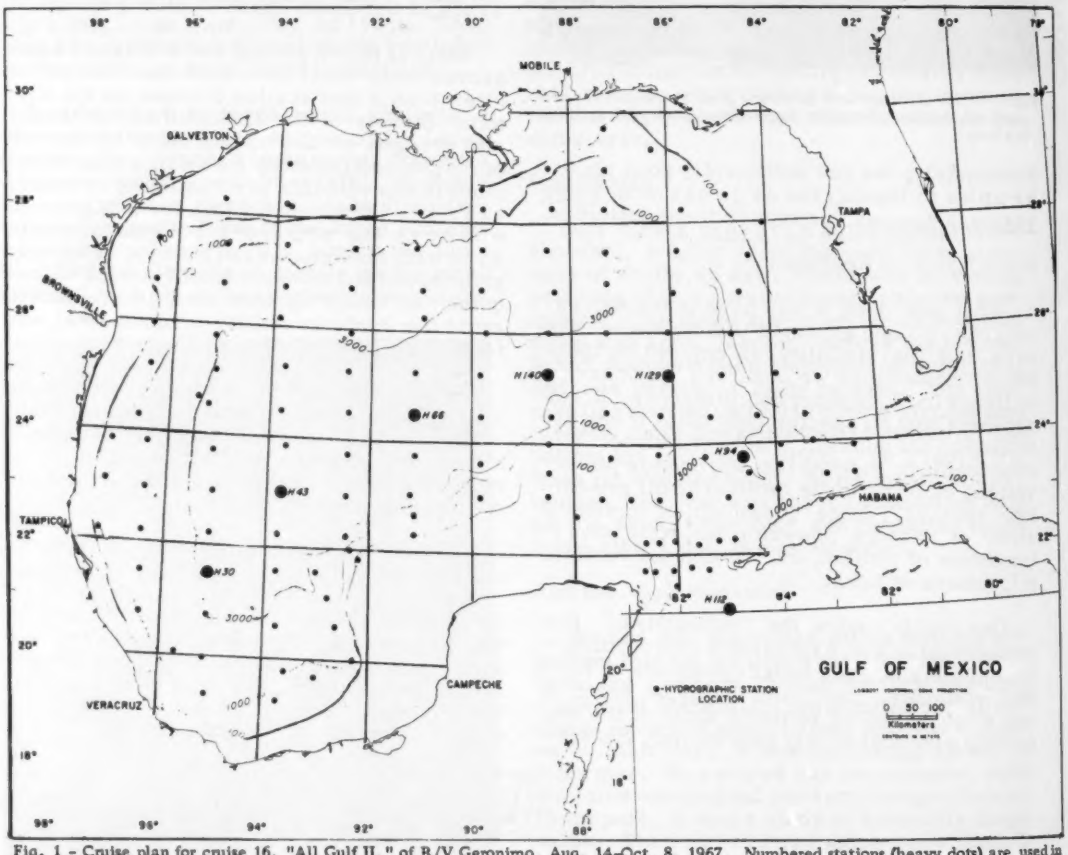

Fig. 1 - Cruise plan for cruise 16, "All Gulf II," of R/V Geronimo, Aug. 14-Oct. 8, 1967. Numbered stations (heavy dots) are used in figures 2-4.

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Note: Contribution No. 258, BCF Biological Laboratory, Galveston, Texas 77550.

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dissolved oxygen analyses were made at sea. Additional water samples were frozen aboard ship and returned to the laboratory for chemical analyses of phosphates and silicates.

When weather and sea conditions permitted, vertical plankton hauls were made at the hydrographic stations; 119 zooplankton samples were collected to a maximum depth of 500 m.; 141 phytoplankton hauls were made to a depth of 30 m.

Although the cruise data still are being processed, measurements from 7 stations have been analyzed to depict some major features of the Gulf waters (see fig. 1 for station locations). These stations were selected to describe the structure of the water in the northwestern Caribbean before it enters the Gulf, and then to trace the water as it flows through the Yucatan Straits and spreads through the Gulf. The arc connecting these 7 stations generally represents a line along which the waters spread through the Gulf. The data are presented as vertical profiles of salinity, temperature, and dissolved oxygen for each station.

Six water masses in the Gulf are discernible in the vertical profiles of salinity (fig. 2). Dashed lines connect the cores of the separate water masses. The water masses present in the Gulf of Mexico are:

- Caribbean Surface Water (CSW)--This warm water forms in the Caribbean Sea and moves into the Gulf at the surface. It is characteristically water of relatively low salinity--36.0 to 36.2 parts per thousand (p.p.t.)--and is quickly lost by mixing with the western Gulf surface water (occurs only at stations 112, 94, and 129).

- Western Gulf Surface Water (WGSW)--High evaporation rates in the western Gulf pro-

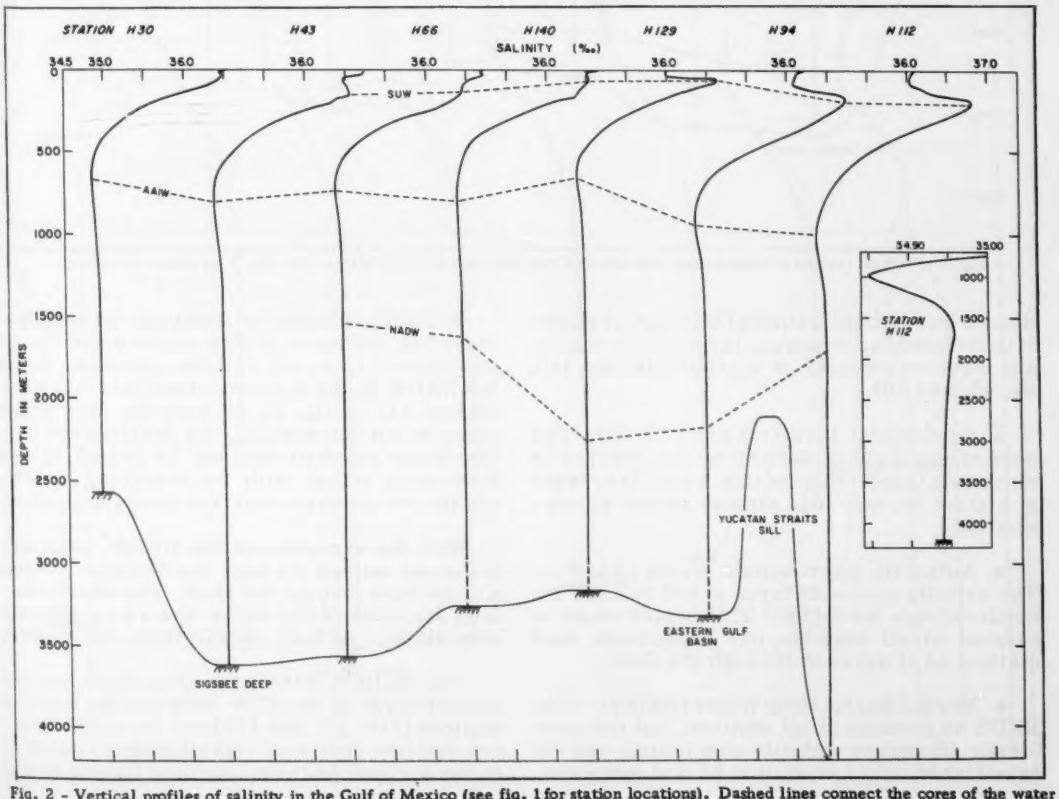

Fig. 2 - Vertical profiles of salinity in the Gulf of Mexico (see fig. 1 for station locations). Dashed lines connect the cores of the water masses. Insert of station H112 depicts characteristic features of deep water masses.

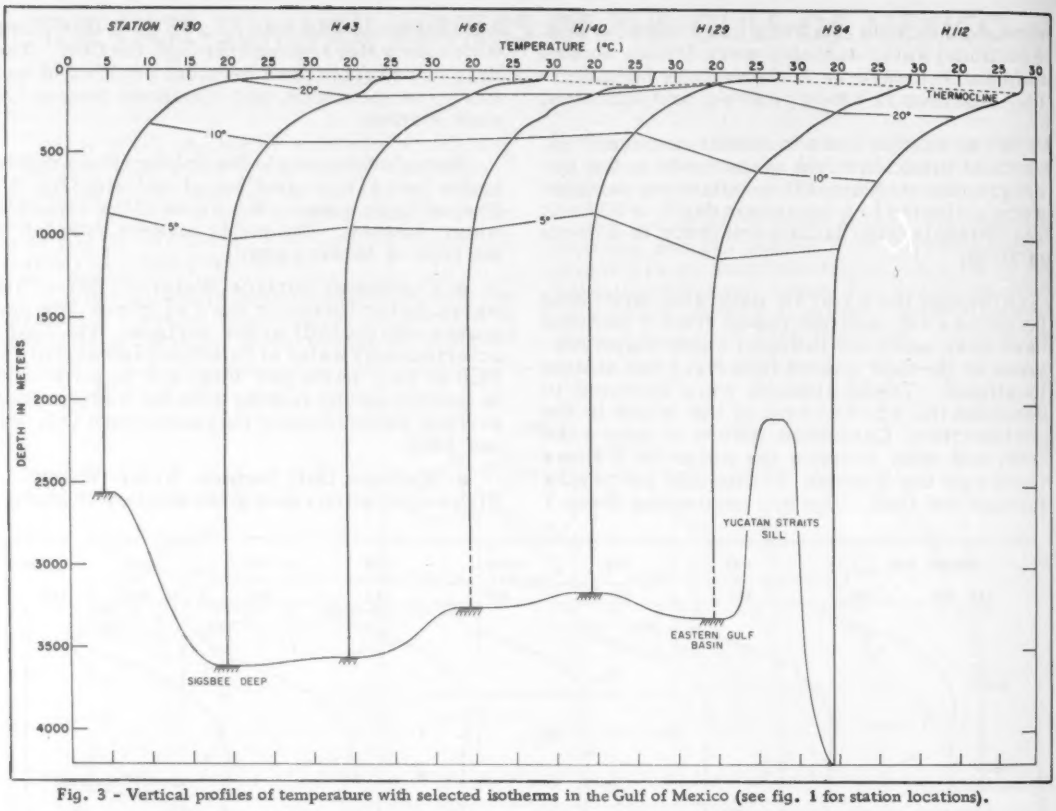

Fig. 3 - Vertical profiles of temperature with selected isotherms in the Gulf of Mexico (see fig. 1 for station locations).

duce a warm, high-salinity (36.5 p.p.t.) water. It is confined to the surface layer in the central and western portions of the Gulf (stations 140, 66, 43, and 30).

• Subtropical Underwater (SUW)--The core of the SUW is defined by the salinity maximum layer. None of this water is present at station 30, and it is almost absent at station 140.

• Antarctic Intermediate Water (AAIW)--The salinity minimum layer at 600 to 1,000 m. depth defines the AAIW. This water mass is present at all stations, but it becomes less distinct as it spreads through the Gulf.

• North Atlantic Deep Water (NADW)--The NADW is present at all stations, but the core (deep, secondary salinity maximum) can be established only for station 66 and eastward.

• North Atlantic or Antarctic Bottom Water--The presence of this water mass can be determined from the salinity decrease below the NADW in the bottom waters (see insert for station 112 in fig. 2). A core for this water mass is not discernible. By the time the bottom water reached stations 30 and 43, it was thoroughly mixed with the overlying NADW, and the two masses could not be distinguished.

With the exception of the WGSW, each water mass enters through the Yucatan Straits and spreads through the Gulf. The characteristic features of the water masses become less distinct as they spread from the source.

The distinct difference in surface waters and strength of the SUW between the eastern stations (112, 94, and 129) and the more western stations indicates that a dynamic boundary in the surface and near-surface layers exists

between stations 129 and 140--that is, the flow through the Yucatan Straits moves as far westward as station 129. Further penetration to the west of these upper waters is much slower, however, and considerable mixing occurs as the water spreads westward.

The rising level of the cores of the SUW and AAIW westward from station 112 to station 129 indicates that the axis of the rapid, northward flow into the Gulf from the Caribbean is to the east of station 129. The varying thickness of the warm, surface water (fig. 3) and the upward slope of the isotherms to the west also depict these features. In addition, the depths of the isotherms indicate that the warm upper waters are never again as deep in the central and western Gulf as in the Caribbean (station 112) and eastern Gulf (station 94).

The deepening of the NADW after entering the Gulf is probably because of spilling of the deep water over the shallow sill of the Yucatan Straits (at about 2,100 m.). The reason for shoaling of the core depth of the NADW in the western Gulf is unclear, but probably the current regime in the deep waters of the western Gulf is somewhat different from that in the upper layers.

The distribution of dissolved oxygen, expressed in milliliters per liter of sea water,

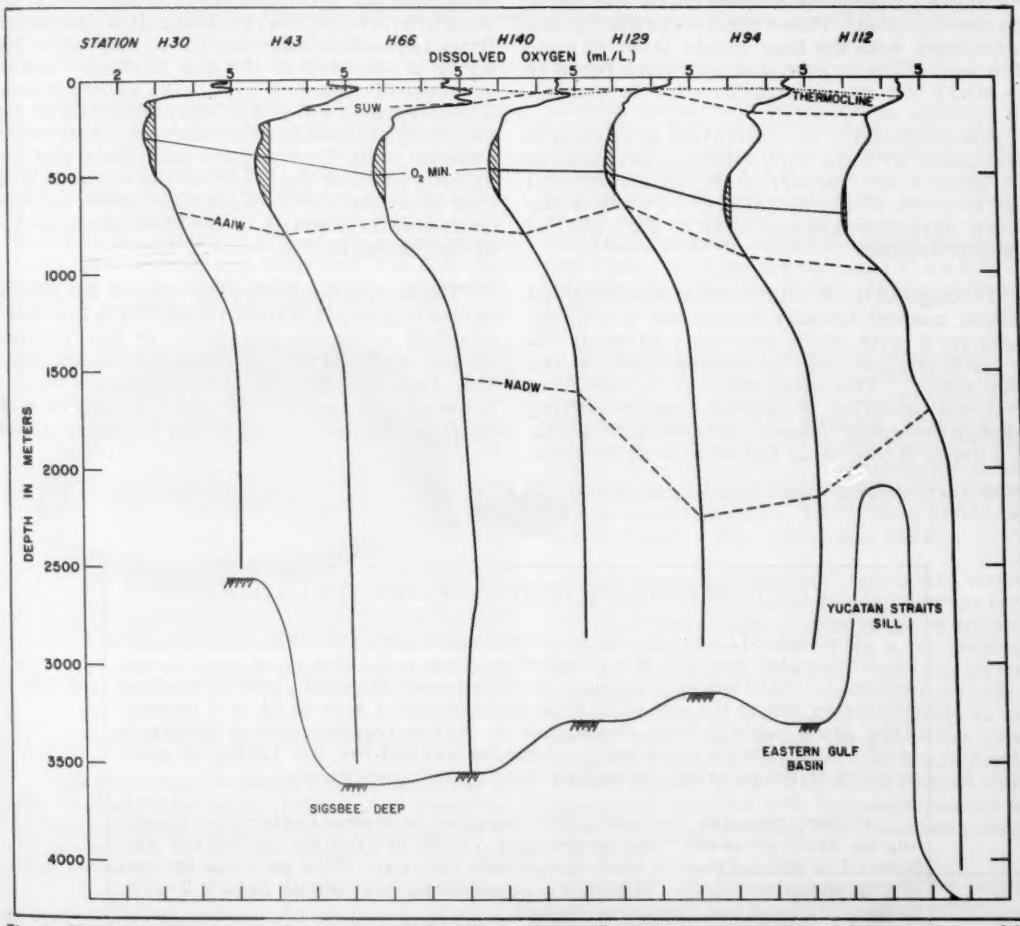

Fig. 4 - Vertical profiles of dissolved oxygen in the Gulf of Mexico showing the oxygen minimum layer (solid line), the top of the thermocline (dotted line), and the cores of water masses (dashed lines--from fig. 2).

is shown at stations along the section from the Yucatan Straits to the western Gulf in vertical profiles (fig. 4). Similar to the conservative properties of salinity and temperature used to characterize a water mass, the dissolved oxygen content (considered a "semiconservative" property) may be a valuable feature in identifying and tracing a water mass.

Along the transect, the surface oxygen--defined as the amount of oxygen in the upper meter of water--shows little variation (4.43 to 4.58 ml./l.) in the CSW and the WGSW. At 100 m., the CSW shows a submaximum oxygen concentration at the thermocline and near the top of the SUW. Two prominent maxima occur in the WGSW: one above and one below the top of the thermocline. These maxima probably are associated with the less stable layer of surface water (low oxygen concentration tends to remain low where stratification is stable).

A subminimum concentration of oxygen is associated with the SUW salinity maximum in the straits and eastern Gulf. In the central and western Gulf, the salinity core and the sharp oxygen minimum (3.52 to 3.57 ml./l.) become diffuse.

Throughout the world oceans, the dissolved oxygen content usually decreases to a minimum value with depth, generally between 700 to 1,000 m., and then increases again in the deep water. The minimum value, resulting from the oxidation of organic matter settling through the water column, is about 2.98 ml./l. at a depth of 700 m. in the straits of Yucatan. In the western Gulf, the depth of the minimum layer rises to 300 m., and the concentration of oxygen decreases to 2.64 ml./l.

As the water passes through the Caribbean and into the Gulf of Mexico, the oxygen content decreases slightly. The oxygen minimum layer in the eastern Gulf coincides with a layer in which water density increases uniformly; this feature is not marked, however, in the western Gulf. The oxygen minimum rises somewhat above the density gradient as the cores of the AAIW and NADW decrease in depth in the western Gulf.

The progressive decrease in dissolved oxygen in the minimum layer from the Caribbean into the Gulf may be a result of insulation from replenishment--which occurs when the water is exposed at the sea surface--and an increase of organic debris in the water column. The oxygen minimum appears to lie at the boundary between the SUW and the AAIW in the eastern Gulf. The oxygen minimum and the salinity core of the AAIW in the western Gulf rise to a shallower depth than in the eastern Gulf, and the identity of the SUW becomes indistinguishable.

The oxygen content at the core of the NADW varies slightly (5.03 to 5.10 ml./l.) in the eastern Gulf along the transect. In the Yucatan Straits at sill depth, about 2,100 m. on the section, dissolved oxygen values were 5.6 ml./l.; however, concentrations did not exceed 5.28 ml./l. along the section in the bottom water of the Gulf.

STATE-OWNED SEED OYSTER GROUNDS IN LOUISIANA

The State of Louisiana owns and manages some 450,000 acres of natural seed oyster grounds where oysters grow wild. The seed oysters are generally selected and planted in September, October, and November when they reach the age of 12 to 16 months and a size of $2\frac{1}{2}$ to 3 inches. They grow rapidly from September to March reaching 4 to 5 inches in length and become more salty. Seasons are set for the taking of seed oysters in these areas depending upon annual conditions.

Oyster growers are permitted to gather wild seed oysters for planting on their privately-leased grounds. They are culled, separated and planted to get maximum food and growth harvest. This process is usually an annual operation, although in some cases may occur over a 2-year period. (Louisiana Conservationist)

REARING LUGWORMS FOR FISH BAIT

By John L. Taylor* and Carl H. Saloman*

The lugworm, Arenicola cristata (Stimpson), is a prospect for bait worm aquiculture. It is an excellent bait for sport fishes and has characteristics that suit it well for rearing under artificial conditions. Preliminary experiments show that lugworms can be grown in sediment trays submerged in a sea-water system. In 6 months, 72 worms worth $3.00 were grown in a tray, 39 in. square (1 m.^{2}) by 6 in. (15 cm.) deep, in a 6-in. layer of sand.

At present, the bait worm business depends on digging for two species--the blood worm, Glycera dibranchiata, and the clam worm, Nereis virens. The annual wholesale value of these worms in the United States is $1.3 million, but both species have biological features that make them poorly suited for aquiculture.

This report introduces the idea of rearing the lugworm, Arenicola cristata (Stimpson), for fish bait (fig. 1). This species occurs along the Atlantic, Gulf, and Pacific coasts of the United States, and related species have worldwide distribution in shallow, temperate seas (Wells, 1962). Lugworms and other large sea worms are collected and sold for bait, but to our knowledge none is cultivated for that purpose (Pope, 1961).

Fig. 1 - The lugworm, Arenicola cristata (Stimpson), from Tampa Bay, Fla., reared under artificial conditions for 6 months.

THE SEA WORM BUSINESS

The sea worm business was established in the United States about 1900 and is based on two species of worms collected along the north Atlantic coast--the blood worm, Glycera dibranchiata Ehlers, and the clam worm, Nereis virens Sars (Westman, 1939; MacPhail, 1954; Klawe and Dickie, 1957). These worms supply bait for sport fisheries along the mid-Atlantic states for a variety of fishes that include blackfish, bluefish, kingfish, porgy, weakfish, sea bass, striped bass, and flounders (MacPhail, 1954; Hawkings, 1966; Anderson, 1968).

Worm digging is a part-time occupation for watermen because weather normally limits the collecting season to about 20 weeks between spring and fall. Where worms are abundant, a digger can work about 0.1 acre (400 m.^{2}) of bottom on a favorable tide (about 4 hours) and collect 1,000-2,000 worms worth $20 or less (Ganaros, 1962; Dow, 1964; Dow and Wallace, 1967; Anderson, 1968).

Sea worms for the bait trade come mostly from Maine, where production has grown from 118 thousand pounds in 1946 to more than 1.5 million pounds in 1966 (Dow and Wallace, 1967). Massachusetts and New Hampshire together market 100 thousand pounds of worms annually, and a small quantity is imported each year from the maritime provinces of Canada. Fishery statistics for the United States show that in 1965 blood worm production totaled 776 thousand pounds and clam worm production 809 thousand pounds.

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Note: Contribution No. 46.

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Wholesale value of both species that year amounted to $1.3 million (Lyles, 1967). Blood worms wholesale for about $1.00 per pound (100 worms), and clam worms sell for about 60 cents per pound (50 worms). On the retail market, however, blood worms sell for as much as $3 per pound, and clam worms bring about $1.25. At these prices, marine bait worms are one of the most valuable products from the sea (Dow, 1964; Hawkings, 1966; Dow and Wallace, 1967).

Pope (1961) suggested that the culture of marine worms would have many advantages over digging them from tidal flats. It would be necessary to develop techniques to make sea worm farming as profitable as the highly successful practice of growing earthworms as a bait for freshwater fishes. A number of problems, however, face the prospective sea worm farmer.

PROBLEMS OF SEA WORM AQUICULTURE

The main difficulty in rearing sea worms is the procurement of enough young worms for farm stock. Blood and clam worms, like most other marine worms, spawn in the open sea where their young are dispersed by tides and currents. The problem is amplified because the juvenile worms require a special diet of plankton that would be difficult to furnish even if they could be obtained by induced spawning under artificial conditions, or by other means. Other factors that prospective growers would need to consider include choice of a seawater system (Clark and Clark, 1964; Parisot, 1967; Fuss and Kelly, in press), site location, capital investment, operating costs, marketing channels and, of course, potential profit.

THE LUGWORM-- A BAIT WORM FOR AQUICULTURE

The lugworm, Arenicola cristata, is good bait for a number of fishes. It has biological characteristics that make it better suited for aquiculture than blood and clam worms, or other sea worms that produce free-swimming larvae. Furthermore, preliminary rearing experiments indicate that engineering and economic aspects of lugworm aquiculture present no serious problems.

In Tampa Bay, Fla., A. cristata is dug in intertidal areas as a fish bait for private use, and occasionally small lots are sold by bait dealers for 50 cents per dozen. On productive grounds, 150 to 200 lugworms can be dug during a low tide. The worms keep well and stay alive for 2 or more weeks in a submerged bait bucket. The lugworm is regarded by local fishermen as an excellent bait for sheepshead, Archosargus probatocephalus (Walbaum), spotted sea trout, Cynoscion nebulosus (Cuvier), red drum, Sciaenops ocellata (L.), and black drum, Pogonias cromis (L.). Lugworms are large enough so that several hooks can be baited by sectioning a single worm, and the tough skin holds a hook well. Fishing trials by a local fisherman[1/] showed that as many as 40 sheepshead can be caught on 10 lugworms.

The foremost characteristic that makes A. cristata well suited for aquiculture is its mode of reproduction. Eggs are fertilized in the female burrow and pushed out in a jelly-like capsule that is anchored to the burrow by a short stalk (fig. 2). Larvae develop inside the capsule, emerge after several segments have developed, and then dig into the sediment. Young worms, therefore, can be collected by simply gathering egg capsules from tidal flats where they have been deposited.

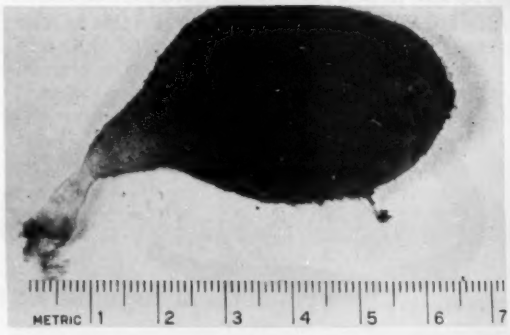

Fig. 2 - Egg capsule of the lugworm, Arenicola cristata (Stimpson), from Tampa Bay, Fla.

Feeding habits of the lugworm are also suited for aquiculture. Embryos are self-sufficient inside the egg capsule and, after hatching, the worm feeds on mixed organic detritus available in sediments. Other advantageous features of lugworms include rapid growth, tolerance of low dissolved oxygen, a sedentary habit, and tolerance to crowding.

REARING LUGWORMS

The first rearing of lugworms was accidental. In September 1966, 12 large specimens

1/L. W. Clay, 4916 Camellia Way, South, St. Petersburg, Fla. 33705.

were discovered in trays of sediment that had been submerged for 1 year in holding tanks of an experimental seawater system. The trays contained transplants of sea grasses; apparently, young lugworms had been introduced to the trays attached to plant sprigs. Sand and gravel in the trays came from a building supply yard, and the seawater system was equipped with a filtration system that eliminated plankton and other particulate material. Filamentous algae also entered the tanks on sea grass leaves and became established on the walls. It provided food for the worms when fragments sloughed off and accumulated on sediment in the trays.

The second success at rearing lugworms was by design. On June 15, 1967, a plywood sediment tray, 39 in. square and 12 in. high (1 $m.^2$ by 30 cm. high), was filled as before with a 2-inch (5-cm.) layer of small river gravel covered by 6 in. (15 cm.) of white sand. The bottom of the tray was perforated and covered with fine plastic screening to allow water circulation through the sediments. The tray was submerged in a holding tank that contained a good growth of algae, and a lugworm egg capsule from Tampa Bay was added. The egg capsule contained thousands of embryos--enough to produce a lugworm population that would be limited only by available food and space.

When the tray was raised on November 11, 1967, 72 lugworms were recovered from the sand-layer of sediment. Whole wet weight of the worms was slightly over 1 lb. (462 grams) and average length was 6 in. (15 cm.). On the basis of the local retail price of 50 cents per dozen, the lugworms produced in less than 6 months were worth $3. If two crops of lugworms could be produced in 12 months, yearly production on an area of sediment 39 in. square (1 $m.^2$) would be about 2 lbs. of worms worth $6. Whether or not such a return warrants the expenditure that would be required to establish a commercial enterprise has not been demonstrated. Results of our attempt to culture lugworms are encouraging, however, and the possibility is good that a practicable method can be developed for rearing them on a commercial scale.

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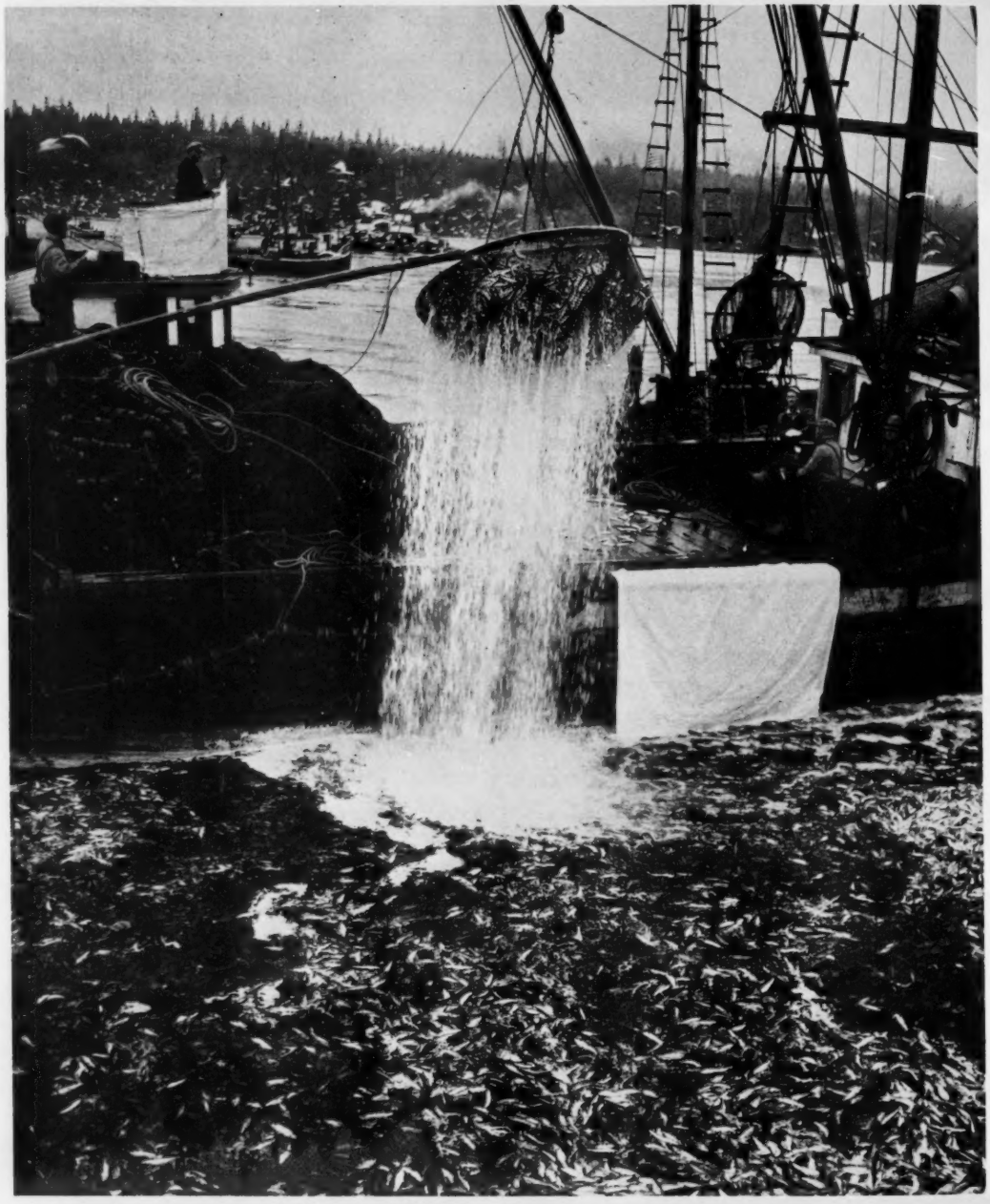

Fishing is one of Canada's major industries. The west coast is an important center. Large canneries handle great herring catches.

The "brailer," or huge scoop net, is being guided by man at end of pole. It lifts 2 tons of herring at a time from great net still in water. A winch supplies the power. (National Film Board Photo)

FOREIGN

CANADA

WIDE SEARCH FOR QUEEN CRAB IN N. ATLANTIC STARTS

Broad areas of the Gulf of St. Lawrence will be explored this year to determine distribution and abundance of queen crabs. It will be done by the Industrial Development Service of the Canadian Federal Department of Fisheries.

Atlantic queen crab (Chionoecetes opilio) has become an increasingly important resource in the Atlantic commercial fishery. It was stimulated by experimental catching and processing under federal-provincial cost-sharing arrangements during the past 3 years.

Last year's catch of queen crab by Atlantic coast fishermen was 1.5 million pounds.

Exploration Is Urgent

Because intense fishing pressure on known stocks is expected, exploration becomes extremely urgent. This is because a crab trap fishery could revitalize depressed areas--and ensure that sufficient stocks exist for increasing demand.

About 40,000 square miles of the Gulf of St. Lawrence may produce queen crabs in commercial quantities. Because of area size, a systematic search pattern must be used.

Lines drawn horizontally and vertically at $2\frac{1}{2}$-mile intervals will provide basic pattern. Decca positions at each point will permit accurate and easily recorded search. While traps set this way could miss small concentrations of crabs, any area of significant population would certainly be bisected, and a more intensive search could be carried out.

The prime areas plotted represent over 5,000 positions to be fished. It will take at least 2 seasons to complete the survey.

Vessels and Gear

Two vessels are being chartered by the Industrial Development Service to carry out the exploration. One is the 65-ft. combination vessel "St. Cecilia II" built last year for the Cheticamp Fish Co-op Ltd., Cheticamp, N. S. She has begun operating in the Gulf off Cape Breton. A second vessel will join later.

Crab traps in the sampling will be of standard size. Frozen herring bait will be used. All crabs caught will be returned to the water immediately after being weighed and measured.

Information Valuable

Information acquired will help considerably an investigation by the Fisheries Research Board of Canada into the life history of the queen crab. Added to commercial fishermen's information, it will help enlarge knowledge about quantities of commercial-size crabs and the effects of environment and season on abundance and biology.

A general report at the end of the 1968 program and interim reports will be published.

Provincial fisheries departments also are undertaking local explorations adjacent to their coasts under federal-provincial cost-sharing arrangements. ("Fisheries of Canada," June 1968.)

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TUNA SEINER 'GOLDEN SCARAB' AUCTIONED

The Canadian tuna seiner Golden Scarab was auctioned recently, but the controversy over the fate of the nation's subsidized tuna fleet and the replacement of local fishermen by foreigners boils on.

The Golden Scarab is one of five 170-foot seiners built since 1965 for C$2.2 million

Canada (Contd.):

each. The Canadian government paid a 50-percent subsidy. A tuna-processing complex was constructed at St. Andrews, New Brunswick, to stimulate the fishing industry and to increase employment. Many fishermen contend that the tuna firm used public money to their disadvantage.

Foreigners the Main Issue

The central issue is the use of foreign fishermen. Three years ago, on her first voyage, the Golden Scarab released her Canadian crew in Central America, hired a U. S. captain and a Costa Rican-Mexican crew. In the 3 years that followed, the vessel made no landings in Canadian ports. On Jan. 29, 1968, when she reentered Canada for the first time, her creditors seized her.

The Canadian fishermen claim that 4 other vessels do the same thing. After negotiating a contract in Canada with local fishermen, the vessel owners give them a "take-it-or-leave-it" pay cut when they reach Central American ports. Most crewmen choose to return home, and the vessel owners hire U. S. skippers and foreign crews.

The Canadian fishermen are urging that the foreign crews be replaced by Canadians.

* * *

NEWFOUNDLAND FISHING INDUSTRY IN TROUBLE DESPITE RECORD YEAR

In 1967, Newfoundland's fisheries set records in landed weight and value. Early statistics showed a catch of 746 million lbs., 11 percent above 1966, according to Aiden J. Maloney, Minister of Fisheries. But markets weakened, particularly for fresh-frozen fish in the U. S. The catch brought only C$26.8 million--a record, too, but only 1% over the 1966 value. Few persons are predicting better prices or greater sales in 1968.

Catholic Church Makes Change

The market started to crumble in 1966 when the Roman Catholic Church lifted its ban against eating meat on Friday. One fisheries department official said the decline was significant first among institutional buyers, such as hospitals and schools, then spread gradually throughout the consumer market. Falling demand resulted in falling prices. To some extent, this has affected all North American producers.

The lower export prices were reflected in lower prices paid by Newfoundland fish-plant operators to the fishermen.

Another factor was the establishment, with provincial government encouragement, of new fish plants in the past 3 years.

Subsidized Foreign Competition

Adding to the province's difficulties was the success of heavily subsidized and more efficient European producers in closing their home markets to Newfoundlanders and making inroads into the U. S. market.

While prices fell, overhead costs in the fish plants rose.

Prices Fall

In 1965, a pound of fresh frozen fish sold for 29¢ in the U. S. It returned 5½¢ a lb. to the Newfoundland fisherman. But in 1967, this price dropped to 21¢, or 3½¢ to the fisherman. P. J. Antle, general secretary of the Newfoundland Federation of Fishermen, fears the fisherman's price could drop to 2½¢ this year.

Antle noted the decision of the Ross Group, London, to cease operation of the Ross-Steers frozen-fish plant on the south side of St. John's harbor. Also, the Job Bros. & Co. plant gave up.

When fresh-frozen prices declined in 1967, many inshore fishermen followed Antle's advice to salt their catches rather than accept what the fish-plant operators were offering. Unfortunately, the salt-fish market declined too. Fishermen in 10 communities on Trinity and Conception Bays protested the low prices by staying ashore.

The devaluation of the British pound in late 1967 also affected several West Indian currencies. This resulted in a loss of export sales there, notably to Jamaica. The result was a high carryover of salt-fish stocks.

By April 1968, Newfoundland fish wholesalers had 9-10 million lbs. of salt fish on their hands. To facilitate marketing this year's catch, the federal government announced in

Canada (Contd.):

May it would buy all unsold salt cod stocks in eastern Canada at the end of the present market period--around the end of July.

Government to Buy Unsold Fish

Federal Fisheries Minister H.J. Robichaud said the purchased fish would be sent as aid to underdeveloped countries. None of these countries would be normal importers of salt fish from Canada. The cost to the Fisheries Price Support Board, which is buying it for the federal government, will be about C$2.2 million. The World Food Program of the United Nations will receive about $500,000 worth immediately; another $50,000 worth will aid South Vietnamese refugees.

Carryover was not limited to salt fish. The declining U.S. market left Newfoundland fish processors with 30-40 million lbs. of fresh-frozen fish on their hands--fish already bought from the fishermen.

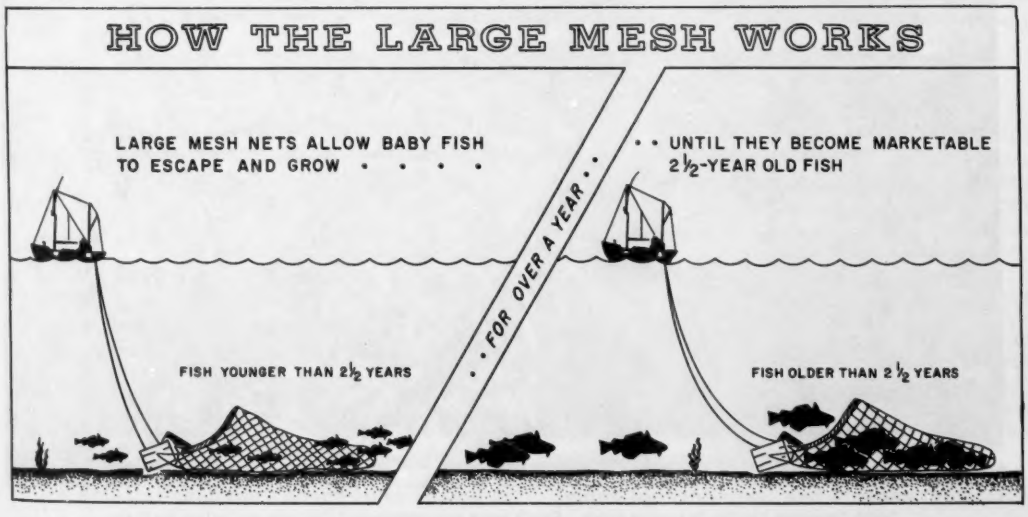
Two more difficulties threaten:

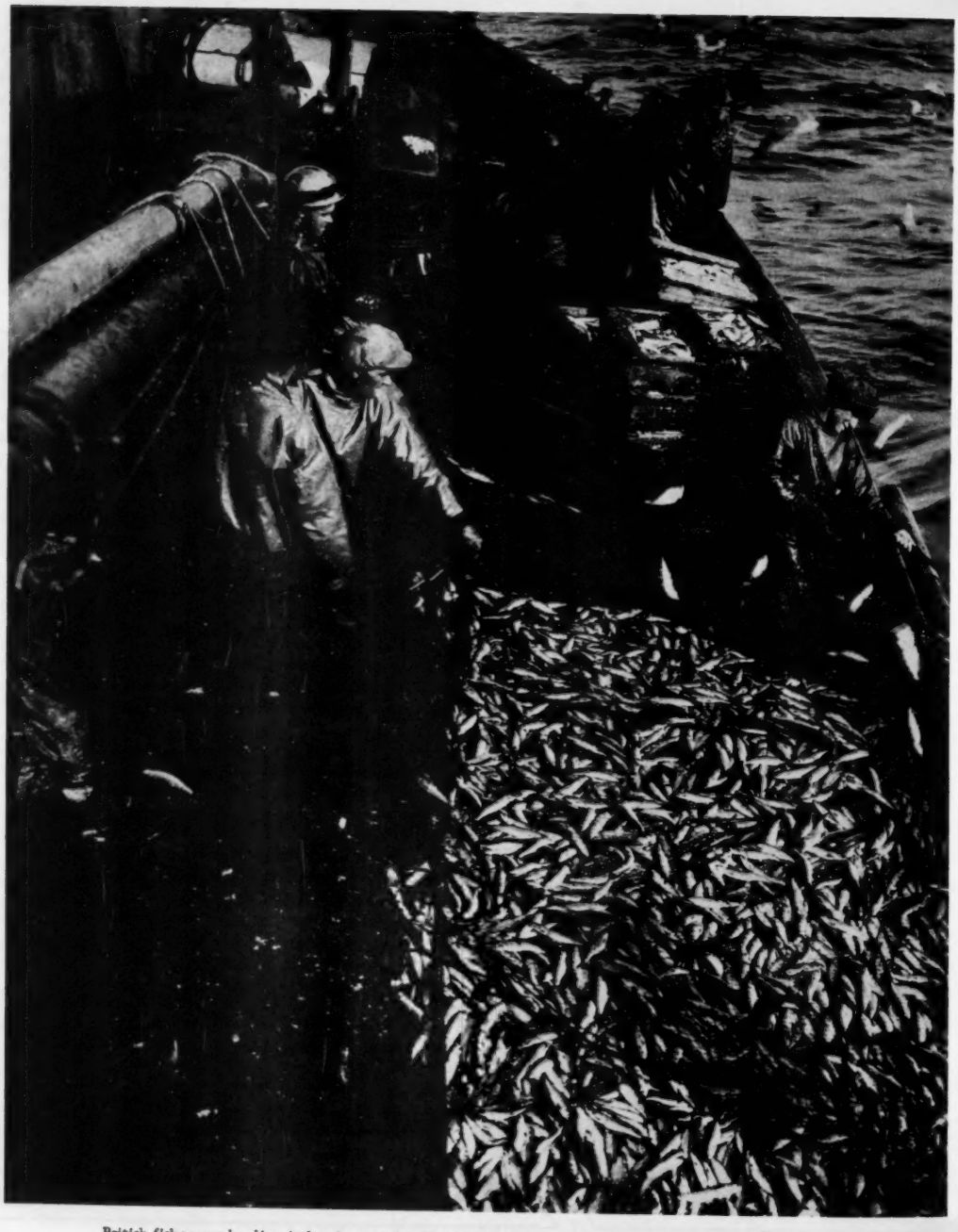
U. S. fish processors are asking U. S. Customs to determine if Canadian producers are dumping fish products on the U.S. market.

Sales of Greenland halibut or turbot have been increasing in recent years. Americans say the name is misleading because the fish is neither halibut nor comes from Greenland.

The Outlook

Some observers say things have to improve because they cannot get much worse. The disappearance of the fishing industry seems too unreal. One fisheries department official sees hope in an expanded and more efficient deep-sea fleet. Modern, more efficient methods of harvest are fine but the problem of marketing the catch remains. The official suggests that the long-range answer may lie in sales of fish meal to underdeveloped countries. ("Financial Post," June 15.)





British fishermen hauling in herring catch. Shoals swim near surface and fine nets are trailed for them.
(Photo: British Information Service)

EUROPE

Norway

EUROPE'S NO. 1 FISHING NATION

Norway, Europe's leading fishing nation and fifth in the world, set a record in 1967. For the first time, she landed over 3 million metric tons, despite numerous bans on fishing for reduction purposes. The substantial increase over 1966, a record year too, was accounted for by North Sea mackerel. Reduced demand and low prices for fish meal and oil lowered the income of fishermen who supply the reduction industry. This development, and a minor reduction in landings of cod and other species, produced a smaller total first-hand value than in 1966. It happened despite the peak in total landings.

Prices abroad fell for principal fish products like meal and oil, stockfish, and frozen-fish fillets. But these were more than offset by record exports of meal and oil. The result was a 13% increase in the export value of fish products in 1967.

The expansion of the purse-seine fleet reached 500 power-blocked vessels in 1967.

Norway's exports of fish products to the U. S. hit a high of $32 million in 1967, due mainly to large shipments of fish meal.

Government Support Steady

Government support continued at about the level of the preceding years. There were no significant changes in government fisheries policy during 1967. There are indications of a more liberal approach emerging--for example, the recent extension of export rights to the Nordic Group for frozen-fish-fillet shipments to the U. S.

Short-Term Outlook Good

The short-term outlook for the fisheries is fairly good, though marketing conditions are far from satisfactory for some principal fish products. The total yield of cod and related fish species for Jan.-Apr. 1968 probably was higher than last year's, but total catches of herring, mackerel, and capelin were one-third smaller than the record first third of 1967.

The most significant development in fish research in 1967 was the government decision to build a US$3 million ocean research vessel planned for 1969/70 operation.

Fishing Fleet

The expansion of the purse-seine fleet peaked in 1967, then interest declined rapidly. This reflected sharply falling first-hand prices, and numerous bans on fishing for reduction purposes. It is commonly believed that the purse-seine fleet of about 500 vessels equipped with power-blocks is more than adequate to land the shoalfish that can be processed by the existing fish-reduction industry.

In the cod fisheries, fleet modernization continued during 1967. The renewal is concentrated on small craft (less than 25 feet) for coastal operation, and large long-liners and trawlers (over 60 feet) for ocean fishing. There is less interest in replacing medium-sized vessels.

Several purse seiners were equipped to transport large quantities of herring and other shoal fish in cooled salt water in 1967. This keeps fish fresh for several days. It may bring about a substantial increase in earnings of purse seiners, provided new foreign markets for fresh fish can be found abroad.

Catch and Value

In 1967, the fishing fleet operated mainly in the waters of 1966. Icelandic herring was fished farther north than before (near Bear Island). Mackerel were abundant in the North Sea and off Shetland and stimulated fishing there.

The 1967 fish catch, including crustaceans, reached a high of 3,003,700 metric tons, 13.5% above 1966. The exvessel value, state price support and transfers from the Herring Price Stabilization Fund included, decreased 13.7% to $161 million. This sharp fall in exvessel value was caused primarily by price cuts in fish for reduction purposes--herring, mackerel, capelin. And this reflected reduced prices for fish meal and oil (see table 1).

Norway (Contd.):

Table 1 - Norway's Landings, 1966-67; Use of Landings, 1967

Species	Landings		Utilization 1967						
	1967	1966	Fresh	Frozen	Dried	Salted	Canned	Reduction	Bait
	(1,000 Metric Tons)								
Capelin	402.8	379.6	-	-	-	-	-	402.8	-
Herring:									
Winter	371.6	460.9	17.1	32.2	-	20.2	8.1	292.4	1.5
Fat	346.0	148.1	1.2	-	-	2.2	0.2	337.6	4.7
Small	106.4	78.5	0.4	-	-	0.1	10.9	94.8	0.2
Fjord	1.2	1.3	1.0	-	-	0.2	-	-	-
North Sea	335.8	454.9	5.0	2.0	-	0.9	0.3	327.5	-
Icelandic	52.1	42.2	-	0.3	-	7.7	-	44.1	-
Total	1,213.1	1,185.9	24.7	34.5	-	31.3	19.5	1,096.4	6.4
Mackerel	866.6	484.0	5.2	12.0	-	3.0	1.8	841.3	3.2
Cod	196.9	197.0	18.5	49.2	71.8	54.0	2.4	0.8	-
Saithe	119.8	142.6	7.6	44.7	31.4	33.7	0.8	1.5	-
Haddock	40.0	62.5	7.8	27.1	2.9	-	1.0	1.1	-
Other	172.5	204.1	27.5	35.8	9.2	24.4	16.0	58.7	1.7
Total	3,011.7	2,655.7	91.3	203.3	115.3	146.4	41.5	2,402.6	11.3

Note: Totals may not add due to rounding.
Source: "Fiskets Gang," published by the Norwegian Fishery Directorate, March 7, 1968, No. 10.

Record catches of mackerel in the North Sea made up the entire increase in the 1967 fish yield. The yield of other main species of fish remained at 1966 levels (cod and capelin or decreased (saithe and haddock). Due to oversupply of fish raw material, the fishermen's marketing organizations banned fishing for reduction purposes 12 times in the North Sea, and 18 times in North Norway, during 1967. A quota system was introduced during second-half 1967.

Herring and Sprat

Until 1965, the herring and sprat catches were the largest. In 1967, these increased about 2 percent: to 1,226,700 tons. Larger catches of fat herring and small herring more than compensated for reduced yields from the North Sea and winter herring fisheries. The 1967 yield of sprat, raw material for the brisling "sardine," was 13,600 tons, slightly above 1966. Including price support and transfers from the Herring Price Equalization Fund, fishermen received $41 million for deliveries of herring and sprat--only 70% of comparable 1966 income.

Cod

The 1967 cod yield was 196,900 metric tons, the same as 1966. Catches of spawning cod fell by 3.8% to 57,900 tons, whereas

Fig. 1 - On herring grounds off Norway's West Coast, large purse seine has been set around submerged shcool. Seine has been pursed and net is being pulled toward mechanized dories to confine fish more closely in net's bag. (Photo: FAO/H. Kristjonsson)

Norway (Contd.):

small improvements were recorded for Finnmark young cod and of other cod from Norwegian and distant waters. The first-hand value of the cod catch, support payments included, was $36.6 million, down 0.3% from 1966.

Other Species

In 1967, the aggregate yield of fishes other than herring, sprat, and cod rose 26%--to 1,580,100 metric tons. Purse seining for mackerel in the North Sea and off Shetland produced a record 866,600 tons. Catches of capelin off Finnmark increased 6.1% to 402,800 tons.

Capelin have been very abundant off Finmark in winter and spring of the last 3 years, 1968 included. This, combined with limited local reduction plant capacity, has created serious marketing problems for capelin. The problems have been met partly by shipping capelin to plants in other districts, and partly by temporary fishing stoppages. Exvessel income from the capelin catch, reflecting poor prices for fish meal and oil, was only about 60% of income from smaller 1966 catch.

In 1967, the catch of saithe dropped 16% to 119,800 tons, haddock dropped 36% to 119,800 tons. These species, plus cod, are the most important raw material for frozen-fish fillets, stockfish, and klipfish.

No significant changes were recorded in landings of high-priced fish and crustaceans: eel, salmon, halibut, crab, lobster, and shrimp.

Disposition of Catch

Deliveries of fresh and iced fish fell 13% to 91,300 tons in 1967. Unchanged, or lower, deliveries were recorded for all major species sold for fresh consumption: haddock, cod, saithe, salmon, winter herring, North Sea herring, and mackerel. (Shrimp and crab are excepted.)

Extremely difficult marketing conditions for frozen-fish fillets abroad reduced over 20% (to 203,300 tons) the fish raw material purchases of the freezing industry. The stockfish industry apparently hoped for an end of the Nigerian civil war and resumption of normal deliveries to this market. It increased fish purchases in 1967 (cod and related species) by 5.1% to 115,300 tons.

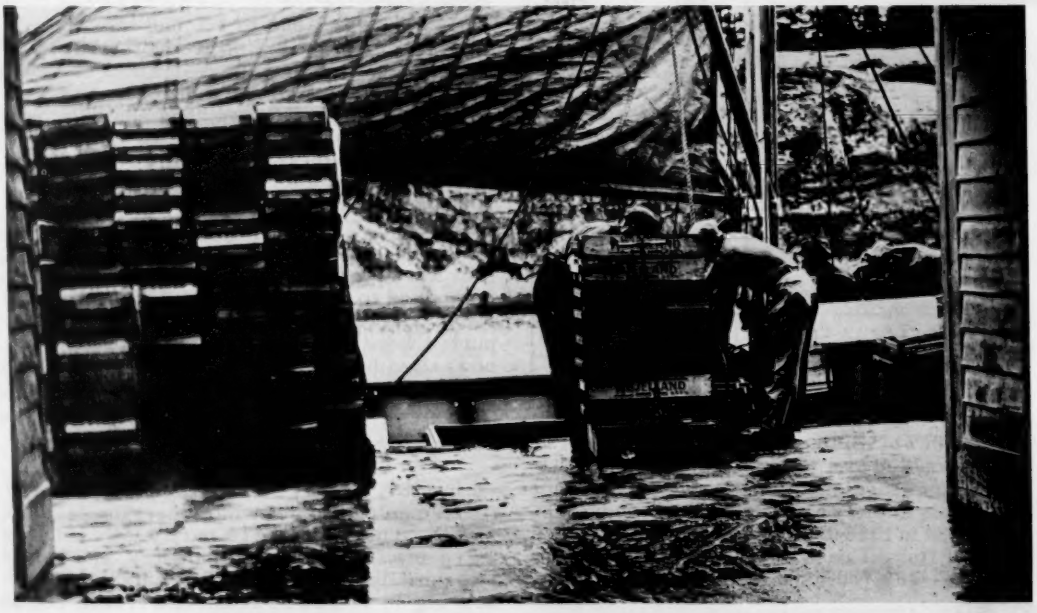


Fig. 2 - Unloading brisling (sardines) at canning plant. (Norwegian Official Photo)

Norway (Contd.):

The fish-salting industry received 114,500 tons of fish, except herring and sprat, or 7.8% above 1966. Herring salting claimed 13,600 tons of fish raw material, or 58% of the 1966 quantity.

Fish deliveries to the canning industry shrank over 15%, to 41,500 tons, in 1967; this resulted from smaller purchases of small herring and sprat. The downward trend in sales of fish for bait was reversed in 1967. It probably reflected a temporary increase in use of long lines.

As in 1966, the most notable production gain in 1967 was in fish meal and oil industry. Deliveries of herring, mackerel, capelin, and other species to reduction plants increased 21%--to a new high of 2.4 million tons.

Foreign Trade

In 1967, income from exports of fish products rose 13% to $244 million. This was 14% of Norway's exports, slightly higher than 1966 (see table 2).

Table 2 - Exports of Selected Fishery Products, 1966-67

	1967	1966
	. . . (Metric Tons) . . .	
Frozen Fillets:		
Haddock	10,966	14,602
Cod	25,583	26,056
Coalfish	19,565	17,828
Herring	6,689	8,435
Other	6,298	5,875
Total frozen fillets	69,101	72,796
Frozen herring	13,167	16,691
Canned Fishery Products:		
Brisling	5,963	7,539
Small sild sardines	13,463	12,637
Kippers	3,348	3,386
Shellfish	523	787
Other	4,133	4,539
Total canned fish	27,430	28,888
Fish meal	494,785	257,289
Herring oil, crude	165,721	80,841

Source: "Fiskets Gang," Jan. 20, 1968, and Jan. 26, 1967.

As in 1966, fish meal was the No. 1 fish export in 1967 in volume and value. Such exports nearly doubled to a record 495,900 tons. Export income for fish meal was $75 million, up 55%. This implies an average price reduction from $184 in 1966 to $150 per ton in 1967. Exports of fish oil rose 105% in volume and 45% in value--165,700 tons and $20 million.

The frozen-fish fillet industry, the other growth industry in recent years, suffered an export setback. Exports dropped 5.1% to 69,100 tons in 1967, and a nearly 12% drop to $32.5 million. Marketing conditions abroad were very difficult during most of 1967, due to oversupply; prices obtained were low. Due to Civil War in Nigeria, the principal market for "African-quality" stockfish not easily marketable elsewhere, 1967 exports of stockfish fell 55% from 1966 level. The Nigerian market, plus greater 1967 production, almost doubled inventories to 20,000 tons at the end of 1967.

Unlike most other major fish products, markets for klipfish were generally satisfactory. Increased sales, particularly in Brazil and Portugal, boosted klipfish exports to 40,900 tons, 13% above 1966. Average export prices obtained were 4.5% higher in 1967 than in the year before.

In 1967, canned-fish exports increased 5.4% in volume to 38,000 tons.

Exports to U. S.

Exports of fish products to the U. S. rose over 50% to record $32 million in 1967. Fish meal accounted for it: exports rose from 22,700 tons in 1966 to 100,800 tons in 1967. Shipments of canned-fish products, the principal fish product in value, remained at 1966's $10 million. In frozen-fish fillet exports to U. S., fierce competition, and sharply lower prices, reduced volume 21%, to 7,700 tons, and value 25% to $3.9 million.

Norwegian Imports

In 1967, imports of fish and fish products into Norway were 23,200 tons and $9 million, compared to 41,200 tons and $11.6 million in 1966. The most important fish products imported were salted cod for klipfish industry, and salted herring and canned fish delicacies for domestic consumption. As in 1965-1966, imports of U. S. fish products were negligible.

Aid to Fishermen

In 1967, the average price received by fishermen per ton of winter herring fell 20% to $37. This reflects partly lower prices paid by fish reduction industry, and partly the smaller portion of 1967 catch of winter herring marketed fresh and frozen and so eligible for price support.

Norway (Contd.):

Table 3 - Average Prices to Fishermen in $ Per Metric Ton		
	1966	1967
Halibut	715	791
Spawning cod	186	205
Finnmark young cod	171	159
Saithe	95	93
Mackerel	50	29
Tuna	443	280
Dogfish	125	126
Source: Economic Survey 1967, Central Bureau of Statistics, Oslo.		

In 1967, $27 million, or 16.8% of exvessel value of fish catch, was appropriated by the Government for price support, reduction of costs for tackle and bait, and for modernization measures. No price support was given for fish delivered to the fish-reduction industry. An undisclosed export income reduction in the Nov. 1967 round of devaluations was partially offset by a $1 million government appropriation.

Government Policy

No significant changes took place in government fisheries policy during 1967. The fisheries still are characterized by fishermen's marketing organizations wielding exclusive rights in exvessel price stipulation and marketing of about 98% of total landings, centralized exports of many principal fish products, state-supported lending facilities (Norwegian Fishermen's Bank), and government subsidization of fish prices and certain cost items.

There are indications of a changing climate in official fisheries policy. Recently, the Ministry of Fisheries extended export rights to the "Nordic Group" for frozen-fish fillets to the U. S. Nordic Group A/L, an organization of 14 independent producers, now joins Frionor as a Norwegian sales organization in the U. S. Also, in a recent speech, Minister of Commerce and Shipping, Kaare Willoch, advocated liberalization of fish exports.

Outlook

The short-term outlook seems fairly good--despite dire warnings that Norway is heading into the worst fisheries crisis since the mid-1930s. In early 1968, the seasonal fisheries' yield, and marketing prospects for several important products, notably frozen-fish fillets, portend at least a normal year. However, marketing conditions abroad for other main products, like fish meal and oil and stockfish, are less satisfactory. They may cause further hardship for those in these fisheries and processing.

Early 1968 Yield

The yield of principal seasonal cod fisheries, spawning cod and Finnmark young cod, was 91,800 tons in the third week of April. This was 25% above the 1967 period. The fish filleting industry has processed 23,000 tons of the total, an increase of 77% over 1967; deliveries of cod for hanging (stockfish) fell 12% to 31,600 tons in Jan.-Apr. 1968. Complete failures of the fat herring and winter herring fisheries reduced deliveries of fish raw materials to the reduction industry by one-third (to 0.5 million tons) in Jan.-Apr. 1968, despite record landings of capelin.

The 1968 output of the fish-reduction industry will drop substantially from the 1967 record of 470,000 tons of meal and 310,000 tons of oil--unless yields of North Sea herring, mackerel, and other shoalfish (small herring, fat herring, sandeel, Norway pout) set record.

Note: All tons are metric.

* * *

HOW INDUSTRIAL FISH LANDINGS WERE USED (JAN.-MAY 1967-68)

"Fiskets Gang," published by the Norwegian Fishery Directorate, reported June 6 these uses of industrial fish from January-May 1967-68:

Norway (Contd.):

Species	Total	Iced Fresh		Frozen		Salted	Canned	Animal Food	Meal & Oil
		Export	Domestic Consumption	Edible	Bait				
	(1,000 Metric Tons)								
Herring:									
North Sea . .	33.6	4.0	-	2.0	0.1	0.3	1.5	-	25.7
Fat	100.7	-	0.1	1.2	2.7	-	0.1	-	96.5
Small	4.2	0.1	0.2	-	0.1	-	2.1	-	1.6
Winter . . .	25.6	4.4	7.2	5.1	0.7	3.5	2.0	-	2.8
Fjord . . .	0.3	-	0.2	0.1	-	-	-	-	-
Total 1968	164.4	8.5	7.7	8.4	3.7	3.8	5.7	-	126.7
Total 1967	511.2	18.1	2.2	33.2	3.2	20.4	10.0	-	424.2
Capelin . . .	497.1	-	-	-	-	-	-	-	497.1
Norway pout .	13.6	-	-	-	-	-	-	0.5	13.1
Total 1968	510.7	-	-	-	-	-	-	0.5	510 2
Total 1967	421.9	-	-	-	-	-	-	-	421.9
Mackerel:1/									
1968	240.6	0.3	1.1	3.0	1.9	0.8	0.2	0.3	233.0
1967	331.1	0.2	0.9	2.2	1.4	1.0	0.2	-	325.3

1/Through Mar. 25, 1968; Mar. 27, 1967.
Notes: (1) Original data converted from hectoliters (hl.) using 93 kilos=1 hl. for all species except capelin (100 kilos=1 hl.)
(2) Totals may not add due to rounding.

France

THE FISHERIES OF FRANCE

France's ranks 16th among the world's fishing nations and 6th among the 36 European fishing nations. She has 1,870 miles of coastline on the English Channel, the Atlantic Ocean, and on the Mediterranean Sea. Yet she remains a net importer of fishery products. The industry is in trouble "because its structure retards development, investment capital is inadequate, the market disorganized, and international competition increasing."

CATCH AND PRINCIPAL SPECIES

Since 1948, the total catch of fish and shellfish has been rising. It increased 57 percent from 512,800 metric tons to a record 804,800 tons in 1966, on a live-weight basis. Most of the increase in recent years may be attributed to new and more powerful vessels. These permit fishermen to exploit offshore resources. Catch value was over US$200 million in 1966.

The industry does not depend on a few species. Large quantities of cod, haddock, hake (European), pollock, whiting, herring, pilchard (European), albacore, yellowfin, mackerel, mussels, and oysters are landed. Cod is valued at about US$14 million. It is the most important fish in quantity and value. Since 1961, landings of yellowfin, tuna, mussels, haddock, saithe (pollock), whiting, and cod have increased; landings of oysters, hake, mackerel, and herring declined.

Salt-Cod

The salt-cod fishery is on the Grand Banks off Newfoundland. Large trawlers of 1,000 to 1,800 tons are used. These make 2 or 3 fishing trips each year, beginning in February and continuing until mid-December. In 1966, production of salt-cod was about 46,000 tons. The newest vessels are equipped to quick-freeze catches. This may become more common than salting cod in the near future. Frozen cod production began in the early 1960s.

Tuna

The tuna industry has been developing steadily. In 1966, 44,000 metric tons were caught--up 6 percent over 1965. The 1966 catch was worth 100 million francs (US$20 million). Four species dominate the catch--albacore, yellowfin, bluefin, and skipjack.

The tuna fishery is divided into the European season and the African season:

European: Main species are bluefin and yellowfin. These are caught in the Atlantic from nearly every important French port between Camaret and Saint Jean de Luz. Concarneau and St. Jean de Luz are the leading ports. About 572 vessels are equipped for tuna fishing, 54 over 1965. The 1966 yellowfin

France (Contd.):

catch was 12,520 metric tons, lower than in 1965; bluefin catches increased to 2,613 tons. Improved prices for both species showed market far from saturation.

There are problems, particularly on the Basque coast. There canneries are working below capacity because catch increases were only modest and competition from the fresh fish market is keener.

African: Two separate fleets are involved. One, based at Dakar, West Africa, has tuna boats and boats with refrigerated holds, and works in winter and spring. The second fleet, tuna freezer boats, operates year round in the Gulf of Guinea.

The catch of the refrigerated tuna boats was 7,985 tons in 1966; this included 5,878 tons of albacore and 2,107 tons of skipjack. The 34-vessel freezer fleet (7,230 GRT) caught 20,866 tons--about 14,000 tons of albacore and the rest skipjack. Total African catch was 28,900 tons.

Shellfish

Since 1957, there have been large increases in production of oysters, scallops, and mussels. Catches have doubled or tripled in some cases. A large market for shellfish is developing.

Outlook

Cod and herring catches have been dropping over the years. Most nations fishing these species in the North Atlantic report declining catches. Overfishing may have reduced available stocks and this is disturbing for the future. Other industry problems include: extension of fishing limits by other nations, declining prices, and increasing competition from other nations for the resource and the markets.

Landings have been increasing steadily. Likely, they will continue in the near future. This optimistic outlook is based on a modernization of the industry, which would offset the difficulties.

Fishing Areas

Small- and large-scale operations are conducted off Greenland and Newfoundland, the North Atlantic, North Sea, Mediterranean Sea, Atlantic Coast of Africa, and France's coastal grounds. Coastal and offshore waters are most productive. These produce around 500,000 tons annually. Cod and tuna are very important distant-water fisheries, especially the salt-cod fishery on the Grand Banks.

In 1966, deep-sea fishing yielded 53,000 tons; landed value was 81.3 million francs (US$16 million). Salted cod were 46,000 tons of the total, a little more than in 1965. Tuna are caught in European and W. African waters. The fresh sardine fishery is conducted off France's Mediterranean and Atlantic coasts; the frozen sardine fishery is off Morocco.

Ports

In 1966, the leading ports in order of importance were:

Port	Tonnage
	Metric Tons
Boulogne	146,000
Concarneau	68,000
Lorient	61,000
Fecamp	31,000
La Rochelle	24,000
Douarnenez	21,000
Bordeaux	17,000
Dieppe	13,000
Le Guilvinec	12,000
St. Jean de Luz	11,000
St. Malo	10,000
Port-en-Bessin	9,000
Les Sables d'Olonne	8,000
Cherbourg	8,000

Often, the fisheries are centralized in certain ports. The fresh fish trawlers that operate off Iceland, Norway, and in the North Sea are based in Boulogne and Dieppe. Trawlers that work the Atlantic as far south as Mauritania and north to Ireland dock in Lorient and La Rochelle. Trips of fresh-fish trawlers normally run 10-15 days. Deep-water trawlers (salt-cod) operating in the northwest Atlantic are based mainly in Fecamp, Bordeaux, and St. Malo. Though Concarneau and St. Jean de Luz are important tuna ports, tuna vessels operate out of nearly every important port. St. Jean de Luz also is an important frozen-sardine port. Les Sables d'Olonne is another principal sardine port. Lobster vessels are important in Camaret. Many ports, including Port-en-Bessin and Douarnenez, are home for line-fishing vessels.

France (Contd.):

FISHING VESSELS

There are about 14,000 vessels totaling 287,992 gross tons in France's relatively modern fishing fleet. Nonrefrigerated trawlers, generally under 250 gross tons each, are most numerous type. About 10,000 vessels are under 10 gross tons, and only 64 are over 500 tons. The number of medium-sized vessels, especially those 25-50 tons, has declined sharply; so has number of under-10 GRT vessels.

The fleet has declined by over 400 vessels since 1961; however, total gross tonnage increased because of significant changes in size and type of power. The fleet has been upgraded, as stern trawlers, moderate-sized trawlers, combination boats, and freezer trawlers have replaced the sailing fleet, coal-burning steam trawlers, and drifters.

Number and gross tonnage of vessels:

	Number of Vessels	Tonnage
Dec. 31, 1960	14,315	255,181
Dec. 31, 1965	13,566	287,776
Dec. 31, 1966	13,906	287,992

In 1962, the deep-sea fleet had 32 vessels: 22 trawlers used exclusively for salting catches, 6 trawlers for both salting and freezing, one all-freezing vessel, and 3 other specialized trawlers.

The construction of freezer vessels is a very significant development of recent years. Vessels no longer are being built exclusively for salting fish. The question now facing the industry is whether a combination vessel (salting and freezing) or a purely freezing vessel is best for its future.

An interesting aspect of fleet modernization is that many large vessels were and are being built in West Germany, Poland, Belgium, and the Netherlands. There, costs were less. Stern trawlers were gradually accepted, but only the largest have complete quick-freezing plants.

FISHERMEN

The number of fishermen has declined over the years to about 40,000: 35,000 are self-employed, about half in South Brittany. Also, an estimated 50,000 workers work in shellfish culture, 13,000 in canneries, 2,000 in curing plants, and perhaps 8,000 in industrial fish plants and other segments of the industry, including marketing.

Fishermen are paid under 2 basic wage plans. In the "industrial" fishery (vessels over 100 GRT), crews receive a guaranteed minimum wage, or a share of the catch proceeds, whichever is greater. In other types of fishing, only the share system is used.

MARKETING

Consumption

Per-capita consumption of fish and shellfish is about 13 kilos, the largest in the Common Market but low compared to other European nations. About two-thirds of seafood consumption is fresh, the rest frozen, canned, and salted. Consumption of canned and frozen fishery products is increasing; that of dried, salted, and smoked products is declining. Country-wide promotion campaigns are conducted. There remain wide variations in fish consumption between different regions. Retail prices for fishery products are high; fish are not inexpensive compared with meat.

Processing

The frozen-fish trade is relatively small compared with the European trade. This is because storage, distribution facilities, and advertising are inadequate. Parts of the industry are now paying more attention to this trade.

Consumption is expected to reach 50,000 tons per year by 1970, triple the present amounts. The interest in increasing production of frozen fishery products is shown by the program of converting deep-sea salting vessels to freezer trawlers.

France produces the largest amount of canned fish in Europe, between 80,000-100,000 tons annually. Rigid controls produce high-quality. The industry consists of about 150 factories, mainly in northern France. There is a concentration in number of plants and significant increases in productivity.

Cod, herring, sardines, mackerel, and anchovies are all cured. Cod is salted aboard ship; additional processing is done ashore. Salted cod is the largest item of cured fish;

France (Contd.):

about 46,000 tons were produced in 1966, far below 1962's 67,000 tons.

Very small amounts of fish meal and oil are produced; about 12,000 tons of fish meal per year.

Distribution

About one-fourth of all landings are shipped to Paris for local consumption, or redistribution to other areas. In the larger ports, fish are (1) auctioned to wholesalers, who sell directly to retailers, (2) sold at agreed price to secondary wholesalers, or (3) sold on consignment to secondary wholesalers who act only as consignees.

Fresh fish is efficiently transported from ports to large cities in refrigerated railroad cars. Redistribution is poorly organized. Refrigerated trucks are being used more extensively for both short and long-distance hauls. Marketing has also been hampered by the tendency of retailers to resist receiving lower profits on volume sales. They prefer low volume and high mark-up.

FOREIGN TRADE

France is a net importer of fishery products. In 1966, she imported 199,000 metric tons of edible fishery products worth over US$180 million. This continues the upward trend of recent years. The imports are 38 percent in fresh and frozen form, 35 percent shellfish, 19 percent canned fish, and 8 percent cured. All have increased since 1961, especially fresh and frozen fish and shellfish.

The Netherlands is the largest seller; Ireland, Morocco, and Norway also sell much. The U. S. is not a large supplier.

Imports of fish oil and meal increased from 96,000 tons in 1961 to 125,000 tons in 1966. Most fish meal and oil originates in Norway; Peru also is an important supplier. French production of fish meal and oil is limited, so imports are necessary.

Exports

Exports have been rising since 1963, when only 35,000 tons were shipped. In 1966, over 60,000 tons of fishery products were sold abroad. Dried, salted, or smoked fish are the primary exports, mostly salt-cod. The amount of cured fish exported in recent years has been declining. Exports of fresh and frozen fishery products have quadrupled since 1963, and now are almost as important as cured fish. Together, these two categories account for over two-thirds of exports. Italy, Belgium, Luxembourg, West Germany, the Netherlands, and the U. S. are primary markets.

GOVERNMENT ACTIVITIES

The principal fishery agency in France is the Division of Marine Fisheries in the General Secretariat for the Merchant Navy, Ministry of Public Works and Transport. The Division has 2 main subdivisions: management and administration of shellfish culture, and economics of marine fisheries. Other bodies are the Scientific and Technical Institute of Sea Fishing, the Credit Maritime Mutual, and an advisory body, the Central Committee for Sea Fishing. Their services relate to scientific and technical research, inspection, educational and training facilities, fish promotion, collection of statistics, and economic studies.

In 1965, the Government created a new organization: "FROM" (Fonds Regional d'Organization du Marche) in northern France, principally covering the ports of Etaples, Boulogne, Fecamp, and Dieppe. FROM was to stabilize catch, avoid market saturation, and improve quality control. FROM's success won it supervision, in 1966, over western and southern ports.

Government activities touch all segments of the industry. The main emphasis is on development and modernization of the fleet. Programs include loans, interest rebates, and subsidies for vessel construction and updating equipment. Many programs are administered by the Credit Maritime Mutuel. Special "incentive" subsidies are provided to encourage use of modern features, such as stern trawls and onboard freezing equipment.

In the Fifth Plan (1966-1970), the government has pledged to: (1) increase landings, (2) improve quality of fish landed, and (3) increase exploitation of previously unutilized or underutilized species. Also, in 1966, a comprehensive expansion program was announced. Its aims were to modernize vessels and equipment, improve shore facilities, increase training facilities, intensify

France (Contd.):

research activities, and increase fish consumption. Financial programs, such as special credit arrangements and subsidies, are included. The main effort will be to increase consumption.

SUMMARY AND OUTLOOK

In 1966, landings of fish and shellfish reached record level of 804,800 metric tons. Landings are expected to continue upward. However, some change in overall catch composition is likely. Several important resources, cod and herring particularly, seem less abundant. Certain fishing areas are being closed to the French as other nations expand fishing limit claims. (France has a 12-mile fisheries limit).

Counteracting these difficulties, however, is the concerted effort by government and industry to construct a more modern fleet. The fleet will be capable of fishing stocks and areas not utilized much--and freezing or processing catches onboard. There is also an effort to modernize the entire industry.

The low per-capita consumption rate of about 13 kilos is receiving much attention. The development of a market for frozen fishery products is the key to increased consumption. However, new products and species also will be introduced. The shellfish market has been developing rapidly.

Little major change is likely in the industry's foreign trade position. France is overwhelmingly a net importer.

Government programs have aided industry development. Primary emphasis has been on upgrading the fleet and its equipment. This will continue. Secondary emphasis is on expanding the domestic market.

* * *

FISHING FLEET DECLINES

As of Jan. 1, 1968, the census of the French fishing fleet carried out by the Secretariat of the Merchant Marine showed: 13,770 vessels, a tonnage of 284,110, and 928,780 hp. The fleet is decreasing. The count was 236 units and 2,893 tons less than a year earlier. No doubt there will be another drop by the end of 1968.

Makeup of Fleet

Fleet distribution is: (1) 23 deep-sea trawlers (2 less); (2) 1,411 "fresh fish" trawlers, probably means without freezer (86 fewer); (3) 54 tuna vessels (3 fewer); (4) 4 sardine freezers; (5) 35 tuna freezers (2 less); (6) 100 "fresh fish" or live-bait tuna boats; (7) 34 lobster freezers (3 fewer); (8) 88 lobster boats (3 less); (9) 1,956 multi-purpose vessels (116 more). ("La Peche Maritime," Apr. 1968.)

* * *

DEVELOPMENTS IN TUNA VESSELS

Barely 20 years ago, the major part of the French tuna fleet was sailing boats. Since then, vessels have been developed for live-bait and purse-seine fishing. They have become larger. Orders for twelve 155- and 165-foot vessels were placed within the last 2 years. A dozen will be provided for Saint-Jean-de-Luz and Concarneau (7 for the latter).

Important Development

The Concarneau vessels represent an investment of US$6.6 million. Incontestably, they mark a new and important stage in the evolution of tuna fishing. They will increase especially the possibility of catching 10,000 to 15,000 metric tons of fish a year. The best profit-earning capacity of a 155-foot tuna vessel is in the 1,500-2,000-ton annual catch. ("La Peche Maritime," Apr. 1968.)

Greece

THE FISHERIES OF GREECE

In 1967, total production from the sea, lakes, and lagoons was 102,317 metric tons. In 1966, it had been 108,082; in 1965, 106,573. This information comes from industry sources and was reported and discussed in the Greek magazine "Alieia," in Feb. 1968.

The reduction was due to the general decline in territorial waters (in Greek seas and lakes because of natural reasons). There was an increase in Mediterranean and overseas catch.

Greece (Contd.):

	Metric Tons		%
	1967	1966	Difference
1) Atlantic fishing	31,817	29,582	+ 7.55
2) Mediterranean fishing and other-than-Greek waters	4,000	3,500	+14.35
3) Midwater fishing	42,000	47,000	-10.64
4) Coastal fishing	14,000	16,000	-12.50
5) Inland water fishing . . .	10,500	12,000	-12.50
Totals	102,317	108,082	- 5.35

Atlantic Fishing

The overseas catch increased by 2,235 tons, 7.55%, between 1966 and 1967. Between 1965 and 1966, it was 2,509 tons, 9.2%.

Mediterranean Fishing

Despite the 14.35% increase in Mediterranean catch--due to more trawlers in Libyan waters--the catch per trawler unit dropped.

Midwater Fishing

In 1967, there was a remarkable decrease from the 1966 catch of purse seiners and trawlers in Greek waters. The 5,000-ton drop, 10.64%, was due to natural causes. The purse seiners did not fish satisfactorily. Only good catches and prices for mackerel prevented greater losses.

Frozen Fish Consumption

In March and April 1968, Alieia reported figures released by the Union of Greek Atlantic fishing shipowners showing 1967 consumption of frozen fish as 31,826 tons. This was a 10.46% reduction from 1966.

The reduction was due partly to the dissolution, for financial reasons, of distribution companies founded by fishing firms to sell their catches. As a direct result, the trading of frozen fish has been taken over by inde-

Fig. 1 - Fleet near Piraeus, Athens' port. (Photo: FAO/H. Menjaud)

Greece (Contd.):

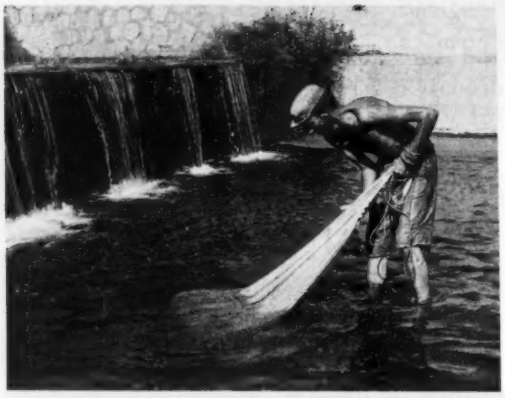


Fig. 2 - Fishing in main canal of modern irrigation system in Serres Valley in Northern Greece. (Photo: FAO/A. Defever)

pendent provincial transporters. The quality and good appearance of the frozen fish have not been maintained.

A second reason was the indifference of independent traders who made small profit on frozen fish. This has made transporters of frozen products turn towards frozen meat and chicken, which offer a high commission.

Processed Fishery Products

The U. S. Embassy reports that Greek processed fishery products include canned fish, salted fish, sea sponges, and fishmeals.

The fish-canning industry consists of only one small factory, the Pelican Co. in Thessaloniki. It also cans vegetables. Pelican's canned-fish output was:

	1967	1966
	(Metric Tons)	
Mackerel (salmon-type)	35	31
Sardines (in sauce, in oil)	-	16
Octopus	1	25
Total	36	72

The decrease in canned-fish production probably results from foreign competition in the Greek market.

Fish Salting

This is done in many small, unmechanized, establishments in coastal localities--chiefly Cavala, Thessaloniki, Volos, and on islands of Euboea and Mitylene. The Directorate of Fishing, Ministry of Industry, has estimated 1967 salted-fish production at 4,000 tons, the same as in 1966.

Sea Sponges

These are Greece's principal processed fishery export product. Sponge production in 1967 was 62 tons, compared with 54 tons in 1966. Sponge fishing occurred in Greek and Libyan waters.

Fishmeals

Production of fishmeals began in late 1965. In 1967, it amounted to 387 tons, compared with 714 tons in 1966. Some owners have decided it is presently uneconomical to produce fishmeals on board their fish factory vessels.

Construction of Fish Markets

The fish markets in Piraeus, Thessaloniki, Patras, Chalkis, and Cavala have been built. Work on the one at Volos is still delayed. The equipment for Patras was obtained from France.

Governmental Activities

A corporation, "ELYPAL," has been established by the Hellenic Industrial Development Bank (ETVA) to organize production and marketing of deep-sea catch. Eventually, it will set up facilities to process fish and fish byproducts. Reportedly, the Ministry of Industry considers assigning management of the fish markets to this corporation, rather than to the Agricultural Bank of Greece, as originally planned. The capital of the corporation is 20,000,000 drachmas ($667,000: 30 Drs. = US$1) and 49% of share capital is open to subscription by owners of deep-sea fishing vessels. The deep-sea catch increased from 1,360 tons in 1956 to 32,000 tons in 1967.

1967 Foreign Trade

Greek exports of fishery products, except sponges, totaled 2,476 tons ($1,454,733) in 1967, compared with 1,954 tons ($1,326,200) in 1966. The difference was due chiefly to increased exports of frozen and salted fish. Exports to the U. S. included: salted sardines 32 tons ($13,166), and canned fish 7 tons ($11,200). Sponge exports were 80 tons worth $2,262,500 (78 tons were bleached or otherwise processed), compared with 102 tons ($2,591,000) in 1966. In 1967, the U. S. was

Greece (Contd.):

the principal buyer of sea sponges (27 tons, $850,700).

1967 Imports

Greece imported 47,304 tons of fishery products worth $15.2 million, compared with 40,620 tons valued at $13.2 million in 1966. Imports included: fresh, frozen and salted fish, 17,010 tons ($6.7 million); canned fish, 12,395 tons ($5.3 million); sea sponges, 27 tons ($476,900); and fish and meat meals, 17,872 tons ($2.7 million).

Imports from the U. S. included: canned fish 3,810 tons ($1,095,000) of which, 3,790 tons ($1,054,800) were squids; 9 tons ($16,100) shrimps; and 3 tons ($8,000) crabs.

USSR

SOVIETS PROTEST JAPANESE FISHING OFF KAMCHATKA

The Soviet Government organ "Izvestia" has published a special correspondent's article stating that the fishing industry in Kamchatka is being threatened with extinction by "piratical fishing techniques" used by Japanese fishermen. The correspondent had spent a day in the radio station of the Main Administration of the Far Eastern Fisheries listening to reports from Soviet resource-management agents aboard surveillance planes. The agents had given numbers and positions of Japanese vessels.

Following these reports, telegrams from fishery kolkhozes (collective enterprises) were received protesting Japanese fishing of spawning herring off Kamchatka's coast. These telegrams cited woes of local fishermen "for whom fishing is the main source of income." The fishermen did not fulfill the 1967 catch quotas because "no herring came to the spawning grounds."

Japanese Vessels Detained

Several Japanese vessels were caught in Soviet territorial waters (12 miles) and detained. When fishery inspectors boarded them, they found "herring which was just spawning or had just spawned."

Party and fishermen's organizations vigorously protested Japanese methods. They demanded that the Government stop them. ("Izvestia," May 24.)

* * *

'VITIAZ' COMPLETES CENTRAL PACIFIC RESEARCH

The Soviet 2,975-gross-ton research vessel Vitiaz completed a 4-month cruise in mid-May (her 43rd exploration) and returned to Vladivostok. The expedition to the Central Pacific was headed by P. Bezrukov.

Research involved hydrogeology, geophysics, hydrochemistry, and biology. The results will be useful to science, navigation, and fisheries.

Made Port Calls

The Vitiaz made port calls at the Fiji, Samoa, Tonga, and Society Islands (Tahiti), and in Hawaii and Japan. In Tokyo, the Soviet scientists met with Japanese oceanographers and exchanged information. ("Vodnii Transport," May 9 and 14.)

* * *

FAR EASTERN FISHERIES GROUP PUSHES TO FULFIL 5-YEAR PLAN

When the current 5-year plan ends in 1970, the Soviet Union's Far-Eastern Fisheries Administration is scheduled to achieve an annual catch of over 3 million metric tons of fish and other marine products. This would be 800,000 tons above 1967. To reach this goal, it is necessary to discover and exploit new fishing grounds, expand deep-sea fishing, and develop and introduce new equipment and technology.

New Fisheries

The Far-Eastern industry has expanded into fishing for herring, saury, Pacific hake, and mackerel. Mackerel is the latest species to be caught in the Pacific by the Soviets on a commercial scale. Aerial spotting is widely used in this operation. Herring and saury are caught in drift nets, purse seines, and by pair trawling; in the Pacific hake fishery, midwater and pair trawling is used.

The Soviet Pacific tuna fleet is experimenting with a special synthetic bait. It has yielded catches exceeding 3 metric tons.

USSR (Contd.):

Pelagic Midwater Trawling

The expansion program of Soviet Pacific fisheries is based primarily on pelagic midwater trawling. A successful development of this technique requires equipping trawlers with reliable echo-sounders and fish-finders. Important midwater trawling experiments were performed in 1967 by the freezer stern trawler "Kalisto" ("Tropik" class, 2,600 gross tons). The results were recommended for adoption by the entire Soviet Far Eastern fishing fleet.

Purse Seining Developments

To increase purse seining's potential, power blocks have been installed on seiners. Specialists are now working to automate such cumbersome operations as stacking and drying seines as another step toward complete automation of purse seining. They also are studying and designing improved models of fish pumps.

Most Soviet seiners in the Far East belong to the RS-300 class (158 gross tons). They are inadequate for deep-sea fishing. Designing and building special high-seas trawler-seiners is lagging. The obvious solution is to re-equip the available trawlers for deep-sea purse seining. Drift-net fishing also is being automated gradually: vessels are fitted with machines for drift-net handling and shaking, and for fish salting.

Other New Techniques

Other techniques include fishing with lights for herring by Sakhalin fishermen. Catches range between 1 and 5 metric tons per haul. The exploratory refrigerated medium trawler "Yu. Gagarin" ("Okean"-class, 700 gross tons) caught nearly 1.4 metric tons of saury in about 40 minutes by combining light fishing with pump fishing. The fish pump was switched on 26 times, each suction lasting 1.5 minutes. Automatic winches and mechanical devices developed by TINRO specialists for automated squid fishing have been successfully tested. They are now recommended for widespread application.

Other Problems to Solve

Among the problems the Far Eastern Fisheries Administration plans to solve in 1968 are automation of long-lining for bottom fish; transshipment of catches in detachable containers to floating bases and processing refrigerator vessels; crab fishing with special traps; and others. ("Vodnyi Transport," May 30.)

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EXPANDS POLAR FISHERIES

The Kola Peninsula lies far beyond the Polar Circle. Half a century ago, it was one of the Soviet Union's most backward regions. Today it is becoming an important economic, industrial, and cultural center of the Northern Regions of European USSR. Under the Soviet regime, the economic potential of the Kola Peninsula reportedly has increased up to 370 times.

Fisheries are the oldest economic activity there. Since a trawler base was established at Murmansk 40 years ago, Soviet fishermen have caught a total of about 13 million metric tons of cod, herring, ocean perch, and other species in the North Atlantic, the White and Barents Seas. More than half that catch (7 million tons) was landed during the past decade. The 1967 catch was the highest in the history of Murmansk fisheries. Preliminary estimates place it close to 900,000 metric tons.

Plans for Murmansk

Scientists of the Kola Branch of the USSR Academy of Sciences have worked out economic plans for the region for 1971-1980. These envisage an increase of about 50 percent for the Murmansk fishing industry. The catch is to rise to 1.1 million metric tons by 1970, and to 1.5-1.6 million metric tons by 1980.

The planned expansion of the Murmansk fishing industry faces many problems requiring prompt solution. One is adjusting wholesale prices for fishery products on the basis of actual labor and production expenditures. This is essential for applying successfully the new planning and economic system for fisheries. Another problem is manpower resources. A third is that scientists of the many research institutes must design machinery and equipment specifically for Arctic use. ("Ekonomicheskaia Gazeta," No. 16, April.)

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USSR (Contd.):

FLOATING FISH MARKET WILL COME TO ROSTOV-ON-THE-DON

The Soviet Ministry of Merchant Marine will build a floating fish market on the waterfront of Rostov-on-the-Don. The project is being handled by the Ministry's Central Design and Building Office at Rostov and will promote fish sales and increase consumption.

The market will be supplied by ten ponds capable of holding 15 metric tons of live fish. The public will be able to select their fish from the ponds.

It will be possible to move the floating market to the ponds to load freshly caught fish. ("Vodnyi Transport," June 7.)

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PLANS 1968-70 AZOV-BLACK SEA FISHERIES EXPANSION

The Soviet Azov-Black Sea Fisheries Administration plans to expand deep-sea fishing in 1968-70. However, fishing in the Azov and Black Seas will not be curtailed. In 1967-68, about 63 percent of the Administration's catch was marine fish; by 1970, this share will rise to about 80 percent. The demand for hake, marlin, and other species is constantly growing in Soviet markets. Explorations and surveys are planned to discover new fishing grounds in the Southwest Atlantic and the Indian and Antarctic oceans.

New Vessels & New Techniques

During the first months of 1968, the Administration's high-seas fishing fleet increased by 20 units. It consists of the "Atlantik"-class stern trawlers, "Rembrandt"-class processing refrigerators, and medium trawlers of other classes. Techniques that are being introduced and developed include trawling at 1,640 to 3,280 feet, purse seining, fishing with artificial light sources, and others. Over 30 vessels of the Odessa, Kerch, Sevastopol, and Novorossiisk oceanic fisheries are operating in the Atlantic.

Problem of Ship Repair

A serious problem facing the Administration is ship repair. In 1967, its vessels were laid up for a total of 1,638 vessel-days. The minimum catch loss to industry is estimated at 33,350 metric tons. This situation is being remedied by more careful handling of vessel equipment, and by crews repairing their own vessels. ("Vodnyi Transport," May 16.)

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WHALING FLEET VISITS AUSTRALIA

A Soviet whaling fleet of 1 factoryship and 20 catcher boats arrived in Sydney, Australia, on May 20, 1968, for a 6-day visit. This was the first shore leave for the crew since the fleet left Vladivostok in September 1967 for the Antarctic whaling grounds. Captain G. V. Vayner, fleet commander, informed the harbor master at Sydney that his vessels required neither oil nor water. Apparently, they had bunkered at sea. Under the Commonwealth Whaling Act, the whaling vessels of all nations enjoy the privilege of bunkering at Australian ports.

4 Months to Capture Quota

Newspaper accounts said it took the fleet more than 4 months to capture its quota of 3,321 whales this year. This was attributed by some Soviet fishermen to a scarcity of whales. Captain Vayner, however, blamed bad weather and rough seas.

Nine fleets hunted whales in the Antarctic during the year--3 Soviet, 4 Japanese, and 2 Norwegian.

The Soviet Fleet

The Soviet fleet's factoryship, the 32,000-gross-ton "Sovietskaya Rossia," is one of 2 whaling factoryships designed and built in the Soviet Union at the Nosenko State Shipyard at Nikolaev. The ship is 715 feet long, nearly 100 feet wide, has 3 decks, and a crew of 521, including 50 women. The ship is carrying a full load of 10,822 metric tons of oil for industrial use, and 7,201 tons of oil for human consumption. Each of the 20 catcher boats is in the 850-gross-ton range and is powered by four 1,000 horsepower diesel engines making 17 knots under full power. It has a crew of 31. One catcher boat killed 246 whales, mostly fin and sei whales.

1,200 Crew Members Shop

The Sydney press said A$250,000 was paid to the 1,200 members of the fleet before they

USSR (Contd.):

came ashore. Inevitably, several stores blossomed with "Russian spoken here" signs. Shopping was brisk. The visit coincided with a "Britain 68" promotion at the David Jones stores. It was an incongruous sight--Soviet fishermen carrying filled David Jones shopping bags lettered "I'm backing Britain" back to their ships. (U. S. Consulate, Sydney, May 24.)

United Kingdom

SHRIMP FARMING MAY BE TRIED

Experiments are now underway in England to determine an economical way of raising shrimp off Yorkshire. This may lead to establishment of a shrimp farm within a few years. Keir Campbell, leader of the experiments, will soon tour Japan, Australia, Philippines, India, Malaysia, Canada, and the U. S. to obtain information on shrimp farming. Plans call for a first year's production of 10 to 40 metric tons. ("Fish Trades Gazette," May 11.)

* * *

LOBSTER FARM PLANNED

A revolutionary idea of increasing lobster stocks on the north and west coasts of Sutherland, in north Scotland, by improving their natural habitat will be tried this summer by ex-naval divers. This unique experiment was thought up by Lieut.-Commander A. J. Futcher.

According to the Marine Laboratory of the Department of Agriculture and Fisheries for Scotland, the population of adult lobsters is limited by the availability of underwater cover when they are extremely vulnerable to predators--for example, when they shed their shells.

To Provide Artificial Cover

Futcher and a team including 3 former naval divers intend to provide artificial cover in selected areas. This will create lobster farms that can be cropped systematically.

Scientists say the stretch of coast from Dounreay to Ullapool is the largest area of underfished lobster ground in Scotland. This project also could help other lobster fishermen.

The Pulford Estates, partners in the venture, will help with administration, management, and marketing outlets.

The team of divers will concentrate on shellfish, not only catching and marketing but farming and preservation of stocks. The effect should be to increase the lobster population on the Sutherland coast.

Iceland

FISH IRRADIATION PROJECT BEGINS

Iceland and the International Atomic Energy Agency (IAEA) announced on June 5 a fish-irradiation project the former is undertaking with the U.S., FAO, and IAEA. Iceland will study the application of irradiation to fish preservation.

Experimentation is being undertaken by the Icelandic Fisheries Research Institute, which has been loaned a portable reactor and equipment by the U.S. Atomic Energy Commission. Reactor and equipment arrived in Iceland early in June. The U.S. also is providing expert personnel to help install and operate the equipment.

Only for Research Now

Although Iceland has no present plans to apply irradiation for fish preservation, she is taking part in the experiment for research purposes. She hopes the technique may later prove of economic advantage to her fish industry. (U.S. Embassy, Reykjavik, June 6.)

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INCREASES COD CATCH

The winter cod fishing season, which ended in May, resulted in a 12% larger catch than last year's winter catch. This was achieved despite the very bad weather that hindered fishing in the first months of 1968.

The 1968 catch was about 156,100 metric tons; in 1967, 139,500 tons. Greater attention is being paid this year to the more

Iceland (Contd.):

valuable cod catch (compared with herring). It had declined 18.7% in 1966 and 22.8% in 1967. It is hoped cod catches will recover to the 1966 level--about 339,000 tons. (U.S. Embassy, Reykjavik, May 27.)

* * *

FISH SLUMP HITS

Declining fish catches and falling world prices for her fish exports have brought crisis to Iceland's economy.

The value of fishery-product exports fell 30% in 1967. Fishery products account for over 90% of total exports and comprise about 20% of the national product. Therefore, the decrease in the value of fishery exports has had significant effects on national income and the balance of payments.

Iceland's Market Problems

The government was concerned over 2 factors in fall 1967: 1) Iceland's exclusion from trading arrangements, pending applications by members of the European Free Trade Association (EFTA) for membership in the European Economic Community (EEC, the Common Market). 2) The effects of EFTA and EEC duties on Icelandic exports. These prompted a government decision to explore the feasibility of joining EFTA.

EFTA countries normally account for 40% of Icelandic fishery exports, and EEC countries for 20%. The U.S. usually is the largest single market. Another important market is the USSR.

Iceland's prospective membership in the EFTA might have long-run effects on the competitive position of U.S. exports. The U.S. is now Iceland's leading supplier.

Counteracting Economic Problems

Measures have been taken to counteract the economic problems. These include the 24.6% devaluation of the kronur in November 1967. The measures have been directed towards restoring balance in external payments--while preventing fishery export price drops from causing further contraction in the export industries--and maintaining a satisfactory level of employment. Industry, particularly fish processing, is being encouraged to reorganize. Capital investment is being maintained at proper levels. Although investment is reduced because of the economic contraction, it will maintain employment and permit completion of major projects expected to help economic development.

Fish Catch Key to GNP

The direction of the Gross National Product (GNP) in 1968 depends on recovery of the fishing catch, particularly white fish, and the direction of export prices, so far disappointing.

The government is paying more attention to prospects for developing new industry as part of the industrial diversification program to lessen Iceland's dependence on the precarious fishing industry.

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GRANTS HERRING PROCESSING AID

Early in May, Iceland authorized the State Herring Board to borrow up to US$260,000 for leasing vessels to transport herring from distant fishing grounds to shore for salting--or for processing either for meal and oil. This provisional act stemmed from a study made by a committee representing fishermen, fishing vessel owners, and herring salters.

The committee recommended that freighters be leased to carry herring, salted on shipboard, to coastal points for further salting; also, that tankers be leased to transport fresh herring to oil and meal plants for reduction.

Industry Problems

The herring catch has declined in inshore fishing grounds. In summer 1967, it was necessary to fish for herring several hundred miles off the Northeast coast. So it has been impossible to bring herring to shore for salting in fresh-enough condition.

Much herring was salted in October and November--when it was not in the best condition for salting. Some herring went into oil and meal, less valuable than salted products.

Iceland (Contd.):

Price declines in herring oil and meal have made it more important for the herring industry to use more herring for salting than for reduction.

The new provisional act has been welcomed particularly by the herring industry. It had objected to an increase in export levies authorized by the Althing in April on salted herring and other species. Further measures concerning transportation of herring to shore for reduction likely are forthcoming. (U.S. Embassy, Reykjavik, May 27.)

Italy

1967 CATCH LIKE 1966's

In 1967, Italy's total fishery catch, including tuna and oceanic species, from pelagic and coastal fishing was 250,188 metric tons--up 0.5% over 1966.

Total catch by seining ("tonnare" and "tonnarelle") was 2,051.9 tons: 1,948.7 tons of tuna; 11 tons of mackerel; 7.4 tons of swordfish; 11.5 tons of bonito; and 73.3 tons of other species. This was an increase of 103.9% over 1966. ("La Pesca Italiana," May 2.)

New Fishing Charts Available

The British Whitefish Authority sponsored a fact-finding survey to accumulate all available data on the exact positions of wrecks and other obstructions to fishing that litter the principal European fishing grounds. The data are contained in "Kingfisher Charts," available from the Whitefish Authority, Lincoln's Inn Chambers, 2/3 Cursitor St., London E.C. 4, England, or from Kingfisher Charts Ltd., 247 Cleethorpe Rd., Grimsby, Lincs, England. Price: £2 or US$4.80.

Sunday is big market day at Fiumicino, small fishing port at mouth of Tiber. Most customers come from Rome, about 10 miles away. Catches per boat are small, selection limited, prices high. (Photo: FAO/P. Johnson)

LATIN AMERICA

Costa Rica

PUNTARENAS ON THE PACIFIC

Puntarenas is the only fishing port of any importance on Costa Rica's Pacific Coast. Its splendid harbor has several shrimp packing plants and a fish cannery. The shrimp plants and their trawlers are by far the most important part of the fishing industry. Their exports are principal earners of foreign exchange.

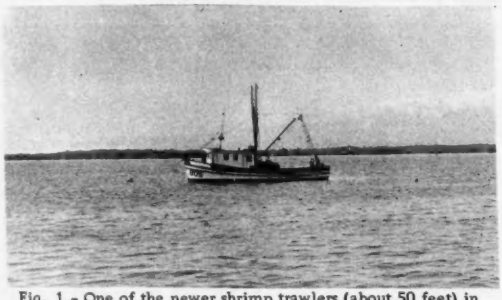

Fig. 1 - One of the newer shrimp trawlers (about 50 feet) in Puntarenas.

The shrimp industries have been the slowest in Central America to modernize. The fleet consists mostly of small unseaworthy craft, and the plants have been backward by any standards. But competition within the local industry and from neighboring countries is bringing rapid change.

Largest Plant U. S. Controlled

The largest shrimp freezing and packing plant is Productos Altamar, Ltds., which is U. S. controlled. In the past 3 years, this plant has been renovated and modernized considerably. It not only packs shrimp for export but produces much shrimp and finfish for the local market.

The newest freezing plant is Frigorificos de Puntarenas, a division of the Borden Company. It is a modern, well-laid-out plant with the latest sorting and freezing equipment. It was slated to be air conditioned completely. The plant is served by 2 company boats and 6 contract trawlers. Two large boats are being built at local boatyards, and more are planned.

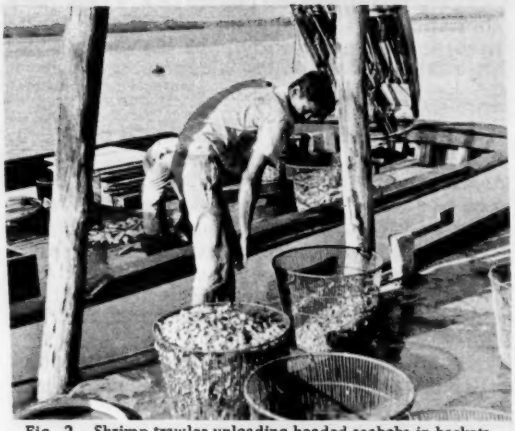

Fig. 2 - Shrimp trawler unloading headed seabobs in baskets on dock of Altamar, S. A. Company has largest shrimp-freezing plant in Costa Rica. Cleaned finfish on deck are for domestic market.

Fig. 3 - Frigorificos de Puntarenas, division of Borden Company, newest shrimp plant in Costa Rica. Puntarenas plants are small. Shrimp are sorted by hand, packed in cartons, and taken to a freezing plant.

Compañía Industrial de Mariscos, Ltda., is the largest locally owned shrimp operation. It is expanding considerably. A second freezing and cold storage unit is under construction and mechanical sorters have been ordered. This plant is served by 7 boats; 3 more are being built locally.

Compañía Empacadora del Pacifico, Ltda., is a combination meat and shrimp packing and freezing operation; the emphasis is on meat. Both products are packed for export. All shrimp sorting is done by hand.

Costa Rica (Contd.):

Two or 3 small companies also pack shrimp. One has very limited freezing facilities; the others simply pack the shrimp and have them frozen in the larger plants.

The Shrimp Fleet

The shrimp fleet has about 55 trawlers, including new ones. Several of these modern craft are large enough to operate outside the protected waters of the Gulf of Nicoya; at least 5 more are under construction. So the fleet is becoming more efficient. The government's limit on fleet size is 50 trawlers; presumably, old, inefficient boats will be withdrawn as new vessels are built.

Despite new and better boats and plant facilities, shrimp production has not increased greatly in recent years.

Pacific Coast Shrimp Catch (Heads-Off Weight)

Production	1964	1965	1966	1967
	. (Thousands of Pounds) .			
White and Brown Shrimp.	1,232	582	744	737
Pink Shrimp	172	320	331	548
Sea Bobs, etc.	1,327	1,551	1,406	1,241
Total All Shrimp.	2,731	2,453	2,481	2,526
Fish	708	1,355	1,313	1,429
Fishing Effort				
Avg. Number Boats Fishing . . .	42	45	48	48
Total Number Boat-Days of Fishing	8,874	9,094	11,162	n.a.

During 1961-1963, the catches for all species were about the same as for 1964. The exception was white shrimp, which were less than half 1964 production. (The category "white and brown" consists almost entirely of 2 species of very large whites.) Since then, the catch of whites has leveled off at slightly above the pre-1964 level. The fishery's growth depends on expanding catches of pink shrimp, which has been done (see table). The newer and better boats are able to take this species, which is found in deeper water than whites and sea bobs. Landings of finfish by shrimp trawlers have doubled in recent years. Consumers in the capital city of San Jose now have a dependable supply.

Fish Canning

The fish-canning operation at Puntarenas is Compañía Enlatadora Nacional, S.A., owned partly by local interests and partly by resident Americans. Until recently, the plant was used solely for tuna canning; fish meal was produced from the offal. Operations were expanded with the construction of a sardine line.

The cannery owns and operates one live-bait tuna clipper, the "Southern Seas," with a capacity of about 150 tons. Once a U. S. vessel, it now carries Costa Rican registry. Although it engages in fishing at times, it is used principally for transporting tuna bought from freezing plants in Ecuador. Most tuna packed in Puntarenas is supplied by U. S. tuna vessels. These sell all or part of their catches under arrangements between vessel owners and the cannery. Early in 1968, a working agreement was made to pack tuna landed by Del Monte vessels, using the Del Monte label, for sale in Central America. The company's own label, Tesoro del Mar, is sold principally in Costa Rica.

Fig. 4 - Tuna clipper "Southern Seas" is the entire Costa Rican tuna fleet. She fishes live bait sometimes. Used mostly to transport tuna bought in Ecuador. (Photographs and information: R. S. Croker, Regional Fisheries Attaché, U. S. Embassy, Mexico City.)

The cannery installed a sardine packing line for 1-pound oval cans in 1967. The fish used are the 2 species of thread herring found in the Gulf of Nicoya. Production has been very small. The development of sardine canning has been slow because of the inexperience of local fishermen, unsuitability of the one available boat and its gear, the unavailability of domestic tomato sauce, and the alleged poor quality of available cans. When production gets underway, it is planned to take advantage of the large demand for canned sardines in the Central American Common Market.

A tuna freezing plant in Puntarenas goes back to the postwar years. Formerly, it was used for transshipments to U. S. canneries. The machinery and equipment have been sold for nonfishery use and the plant is being dismantled.

A group of Puntarenas businessmen, headed by Roberto and Eduardo Beeche, is interested in obtaining U. S. capital to build a tuna cannery. The group believes that the potential Central American market far exceeds the limited production of the existing cannery, which operates well below capacity.

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Guatemala

EXPLOITATION OF MARINE RESOURCES

Guatemala has 402 km. of coastline, 255 km. on the Pacific Ocean, the remainder on the Atlantic. There is a small, growing commercial fisheries industry on the Pacific Coast. There is almost no commercial exploitation of fishing resources on the Atlantic Coast and none is foreseen. This report deals almost exclusively with commercial activity on the Pacific Coast. Subsistence fishing is carried out on both coasts, but it is difficult to assess its importance.

Fish Caught Off Guatemala

The major effort goes to catching shrimp. Other fish and crustaceans and mollusks also are caught for commercial use. The types of shrimp are: Peneaus stylirostris; P. vannamai; P. californiensis; P. brevirostris; Trachipeneus byrdi; T. faoea; T. similis pacificus; and Ciphoneus ribeti. The following types of fish are frequently caught in the same nets that capture shrimp (local Spanish names are in parentheses): Lutjanus griseus colorado (Pargo); Epinephalus striatus (Bosh) (Moro); Platisa vulgaris (Lenguado); Centropomus undecimalis (Robalo); Huro nigricans (Bonito); Mugil lisa (Lisa); Albula vulpes (Raton); Alectis crinus (Palometo); Cynoscion spp. (Colbina). Because processing plants are lacking, most fish are returned to the ocean. Among crustaceans frequently caught are: Loligo vulgaris, and Panilurus interrpus e inflatus.

The Local Industry

Tables 1-3 detail recent and projected fish catches, exports, and local consumption. Since 1963, exports of shrimp, fish, crustaceans, and mollusks have averaged about $2 million annually. Thirty small shrimping boats belong to 3 private companies. Guatemalan law limits each company's ownership to 10 ships.

Table 1 - Actual and Projected Catches of Fish, Shrimp, Crustaceans and Mollusks

Product	1963	1964	1965	1969	1974	1984
	(Metric Tons)					
Fish	130	210	242	600	2,000	4,176
Shrimp	905	1,318	897	1,600	1,600	1,600
Crustaceans and Mollusks	19	21	13	50	65	100
Total	1,054	1,550	1,152	2,250	3,665	5,876

Table 2 - Actual and Projected Exports of Fish, Shrimp, Crustaceans and Mollusks

Product	1963	1964	1965	1969	1974	1984
	(Metric Tons)					
Fish	-	-	-	-	800	2,176
Shrimp	643	1,010	825	1,400	1,300	1,200
Crustaceans and Mollusks	-	-	-	-	-	-
Total	643	1,010	825	1,400	2,100	3,376

Table 3 - Apparent Domestic Consumption of Fish, Shrimp, Crustaceans and Mollusks

Product	1963	1964	1965	1969	1974	1984
	(Metric Tons)					
Fish	130	210	242	600	1,200	2,000
Shrimp	262	308	72	200	300	400
Crustaceans and Mollusks	19	21	13	50	65	100
Total	411	540	327	850	1,565	2,500

Note: Columns may not add due to rounding.
Source: Director General of Statistics and Ministry of Agriculture.

Of the 30, 20 operate out of Champerico in Retalhuleu Department, southwestern Guatemala; the remainder operate out of Iztapa, adjacent to San Jose in Escuintla Department, south of Guatemala City.

Each shrimp boat averages 2 trips per month to fishing grounds off Guatemala; these trips average about 13 days per month at sea. Ten of these boats are wood, the remainder steel. Each boat is worth about $65,000. Government officials estimate that each boat can catch roughly 100,000 pounds of shrimp a year.

There are 2 shrimp processing plants. The larger is in Champerico. It has freezing and storage facilities, a processing plant, workshops, etc. A substantially smaller plant began to operate in Iztapa in May 1966.

Guatemala (Contd.):

Fishing Industry Potential

The government estimates that shrimpers are forced to throw back into the ocean roughly 5-10 pounds of fish for each pound of shrimp caught. This is because there are no facilities for processing fish. The government is interested in increasing exploitation of its fishing resources. It plans to construct a Pacific Coast port, which would handle cargo and receive fish. This project will cost about $15 million. The government is seeking international help to begin construction.

Diet Would Improve

Additional fish-processing facilities must be constructed and the fleet expanded. Presumably, these investments will be made by private enterprise. Fish caught as a result of these new facilities could augment the national diet, extremely deficient in protein. Current consumption is estimated at 600 grams of fish per person per year. Fish is virtually unavailable through commercial channels in most rural areas of Guatemala. With new construction, the fish now caught but thrown back could be frozen or otherwise processed for human consumption, or turned into fish flour. Exports of fish and fish products could be a useful new source of foreign exchange.

Tuna Resources

The government feels that tuna resources off the coast are most promising for large-scale exploitation. The government estimates roughly that about 4,000 to 5,000 metric tons of tuna per year are caught off Guatemala in the area extending 5 degrees of latitude and 5 degrees of longitude off the Pacific Coast.

The projections for increased catches shown in the tables assume construction of a new port, related processing facilities, and more boats.

Haiti

THE SPINY LOBSTER FISHERY

The Haitian annual catch of spiny lobsters during 1963-67 was only slightly larger than total exports, report trade sources. This is because there is little domestic consumption. All exports are frozen and go to the U. S. The 1967 data show imports of 214,000 pounds; however, trade sources report shipments of over 300,000 pounds.

Preparation For Export

Six companies export lobster tails to the U. S. In preparing tails for shipment, the heads are removed. The tails are deveined, cleaned, wrapped in plastic or cellophane, quick-frozen, sized, boxed, and stored at 0° to 5° F. until shipped. Tails are sized according to weight in ounces. The categories are: 2-4, 4-6, 6-8, 8-10, 10-12, 12-14, 16 and over. The U. S. restaurant and hotel industry pays prime prices for the 4-6 and 6-8 oz. sizes.

A 10-lb. pack is standard. The most common practice is to assemble 4 packs in a master carton. Less common is the 60-lb. master carton.

The lobsters are shipped to the U. S. via Grace Lines. Good schedules, reliability, and refrigerated cargo holds have played a large role in the growth of Haiti's spiny lobster tail industry.

Industry's Future

Industry opinion regarding its future is divided. The growing competition for the spiny lobster concerns everyone. Some exporters are pessimistic and defensive. They see their role as holding on to their share of production, while carefully watching production costs.

Others, including the progressive firms, are confident. They foresee opportunities for greatly increasing yields by purchasing modern equipment and adopting advanced fishing practices. Also, they claim, diversified production is possible. They cite the feasibility of large shrimp catches, filleted fish sales, and commercial fish and frog farming.

Haiti (Contd.):

Over 80 percent of the catch is made with conch meat-baited bamboo or wooden traps. The remainder is taken with spear gun. The best fishing is in the waters of the southern peninsula. Boats ply from Port-au-Prince to Jacmel. The Cayes area is consistently the biggest producer.

A slight seasonal variation is evident. The north shore of the southern peninsula produces better in spring and summer, while the southern shore yields more in fall and winter.

The Agents

Most exporters have established relationships with agents, known locally as "speculateurs," throughout the southern peninsula's coastal settlements. The speculateurs pay fishermen $0.60 to $0.80/lb. for the tails. The fishermen's weekly catches average 40 to 60 lbs. Against this catch, the speculateur often makes a small cash advance. He also provides fishermen with styrofoam ice chests and ice to store their catches.

Most exporting firms own 2 or 3 boats that sail the coastal waters. Routinely, they call on speculateurs and take on their shipments. The speculateurs add $0.10 to $0.15/lb. when selling to the exporter. If the speculateur delivers his tails to the exporter in Port-au-Prince, he gets $1.15 to $1.30/lb. All tails eventually reach Port-au-Prince. There the exporters maintain their own freezing and storage equipment. The meat is highly perishable, so all must be done quickly.

Speculateurs are paying ever-higher prices to hold on to their client fishermen, while trying to attract their rivals' fishermen. The result is that exporters must pay more per pound for the tails--and have to sell them in a market where fairly stabilized prices have existed for nearly 3 years.

Exporters Also Deal With Fishermen

Some exporters also deal directly with fishermen, supplanting the speculateur. Exporters have even provided outboard motors to client fishermen to increase production. The experiment has been successful because fishermen prefer to make the most of their leisure time rather than their catch. Lacking mechanical sophistication, they tend to abuse the machines.

Two exporting firms fish to supplement their purchases, and a third is preparing to do it. To maintain a coterie of client fishermen, the exporter buys all or some of their catch of fish, conch, and shrimp. The fish are sold either locally or find their way to the Port-au-Prince market. Insignificant amounts of conch meat and shrimp have been exported to the U. S. Little demand apparently exists for the former, while too few shrimp are caught to support an export industry. An attempt is about to be made by 2 firms to increase shrimp production by using modern equipment. (U. S. Embassy, Port-au-Prince, May 24.)

Guyana

SHRIMP INDUSTRY HALTED BY LABOR DISPUTE

Shrimp fishing in Guyana has been halted by a dispute between vessel captains and owners of shrimp companies and vessels. The captains, U. S. citizens, demand that the National Maritime Union be recognized as their bargaining agent in dealings with owners. The companies, U. S.-owned, have rejected the demands and threatened to close their Guyana plants. The stalemate continues.

Shrimp Industry

Guyana, the former British colony of British Guiana, is on the northeast coast of South America, east of Venezuela. The population is 650,000. Major industries are agriculture and mining.

The shrimp industry, a major earner of foreign exchange, employs about 800 Guyanese. In 1967, Guyana exported to the U. S. about 9,500,000 pounds of shrimp worth US$7,400,000 (nearly one-third of all shrimp exports to U. S. from South America). The Government obtains about US$500,000 annually in taxes and export revenues, and reportedly millions more in wages, local purchases, and similar expenditures.

The Fleet

The fleet numbers about 130-150 vessels. Basically, it is foreign-owned, the bulk con-

Guyana (Contd.):

trolled by U. S. interests. Vessels usually are skippered by U. S. captains; the crews (usually 3 men) are Guyanese. (St. Petersburg "Evening Independent," June 12; Dept. of State.)

* * *

SHRIMP INSPECTION

Two packing plants prepare shrimp for export to the U. S. One is owned by Georgetown Seafoods Co., the other by Guyana Industrial Holdings. Shrimp are caught mostly by U. S.-registered trawlers. Trawlers and packing plants, alert to improvements, appear to be operating under adequate sanitary and quality controls.

Sanitary Regulations At Sea

The following sanitary regulations are generally observed in shrimp processing. After discharging shrimp, trawlers are scrubbed with detergent and nontoxic disinfectant. Concrete holds, built in most trawlers, are easily cleaned. Georgetown Seafoods cleans its trawlers a second time before sending them to sea.

At sea, shrimp are stored on fresh ice under mechanical refrigeration; they are usually stored 7 to 10 days.

Plant Sanitation

When shrimp are unloaded, they are moved by conveyors from dock to adjacent packing plants. Plants use cholorinated water. All machinery, scales, work tables, and floors are washed with water and sprayed with disinfectant at least once a day. Blast-freezing rooms have a capacity to chill from -60° F. (Georgetown Seafoods) to -35° F. (Guyana Industrial Holdings. Storage rooms in both plants can reach a minimum temperature of -20° F.

Workers wear uniforms, rubber gloves, boots, and headgear. Workers are required to rinse their hands with a disinfectant after using toilet facilities.

Plants are inspected periodically by a government team for sanitation and proper refrigeration.

Quality Control

The following quality-control standards are generally observed: Workers on inspection belt (6 at Georgetown Seafoods, 8 at Guyana Industrial Holdings) separate out broken and blemished shrimp. Every 10th package is spot-checked at Georgetown Seafoods.

The following steps are being taken to increase sanitation and quality control: Guyana Industrial Holdings plans to: (a) buy a high-power water pump to scrub trawler holds more effectively, (b) buy booster for blast freezer to lower temperatures to -40° F. Georgetown Seafoods operates an improve-as-you-go plan to raise performance of workers and to increase product quality. (U. S. Embassy, Georgetown, Mar. 13.)

Peru

FISH MEAL PRODUCTION SET RECORD IN EARLY 1968

The 1967/68 Peruvian anchovy fishing season closed May 31 after producing 9.5 million metric tons. Production of anchovy meal continued at record levels during early 1968. The larger-than-expected rise reflected the Government's increase of the 1967/68 anchovy catch limit from 8 to 9.5 million metric tons. Fishing conditions continued favorable through May.

Despite the Feb. 17-Mar. 16 "veda," or closed season, the Jan.-May production was 34,556 tons above the 1967 period. However, exports of 888,706 tons during the same 5-month period sharply exceeded the 610,350 tons exported during the year-earlier period. Stocks remained high. On June 1, 1968, 727,916 tons were on hand compared to 751,636 tons at the same time in 1967. Production during the 1968/69 season will depend heavily on the level of the anchovy catch limit imposed. A slightly higher extraction rate, however, would tend to increase production if more plants use evaporator equipment. This equipment improves the recovery of soluble solids. The Government passed a law on June 20 exempting imports of stickwater plants from certain customs duties for 3 years.

Peru (Contd.):

Bulk shipments of fish meal were initiated in 1963. They dropped, then resumed this year and could exceed 100,000 tons by year end. The move toward pelletized bulk meal reportedly could reduce costs by US$7 a ton. ("World Agriculture and Trade," U. S. Dept. of Agriculture, June 1968; U. S. Embassy, Lima, July 2.)

Fish Meal Stocks

Stocks of fish meal on May 31, 1968, were at a record seasonal level of 727,916 tons, compared with 712,506 on April 30 and 714,578 on April 15.

On May 31, 138 fish meal plants were operating, 53 others had closed, 8 had been dismantled, and 1 had moved.

Fish Meal Exports

Total fish meal exports for Jan.-May 1968 were the highest in several years: 1967--610,350 tons; 1966--626,744 tons; 1965--785,817 tons.

Fish Oil Exports, by Country of Destination, Jan. -May 1968

Country of Destination	Metric Tons
Crude:	
West Germany	24,346
Denmark	4,719
Ecuador	800
Netherlands	52,530
Norway	3,017
Total	85,412
Semi-Refined:	
West Germany	12,293
Colombia	7,776
Denmark	5,627
Ecuador	779
Netherlands	61,277
U. K.	1,184
Total	89,936

AMMONIA FOR SPEEDY PRESERVATION OF FISH

Liquid or gaseous ammonia may solve an ancient problem of keeping fish from spoiling in the tropics.

A quick and easy treatment of immersing sardines in ammonia has preserved fish for more than two months without deterioration of their nutritive value. Using the ammonia treatment soon after fish are caught allows bulk storage at ordinary temperatures.

In many parts of the world, large catches of good edible fish become available during short seasons.

When facilities for cold storage are inadequate, spoilage is extensive and valuable food is wasted. In the tropics, fish spoilage starts within a few hours after the catch.

The safe, speedy method of immersing the fish, in particular sardines, in ammonia solution for about one to two hours and then transferring to an air-tight vessel preserved fish for months in excellent condition, the scientists found. Temperatures were kept at about 77 to 86 degrees Fahrenheit.

Ammonia is a colorless gaseous compound of nitrogen and hydrogen with an extremely pungent smell and taste. As the fish is dried and processed into fish flour, the ammonia is removed and the preserved fish is free from pathogens and has a low bacterial count.

There is no measurable residue of ammonia in the final product, report V. Subrahmanyan, N. L. Lahiry, M. N. Moorjani, R. Balakrishman Nair and M. A. Krishnaswamy from the Central Food Technological Research Institute in Mysore, India. (Reprinted, with permission from "Science News," weekly summary of current science, copyright 1966, by Science Service, Inc.).

ASIA

Philippines

THE FISHING INDUSTRY

The Philippine Fisheries Commission reported that fish production in 1966 was only 5.7 percent above 1965. This increase does not meet the needs of a growing population and the increased consumption of fish. Imports of canned fish and fishery products dropped slightly in 1966. The Philippines imported 50.1 million kilograms of fish and fishery products worth ₱59.5 million (3.9 pesos equal US$1).

The major import was canned mackerel. The share of the Philippine market for U. S. fishery products in 1966 was about the same as in 1965: ₱2.3 million. In 1966, the Philippines exported ₱4.9 million in fishery products, a substantial increase from 1965's ₱2.8.

Problem-Plagued Industry

As a result of high operating costs and lack of fish for canning, the White Rose Fish Cannery was not able to begin operation. Negotiations were underway to sell the cannery to a firm in Kuwait for installation there.

The industry continues to be plagued by government neglect, lack of capital and refrigeration facilities, and a poor distribution system. In 1968, President Ferdinand Marcos requested the Fisheries Commission to prepare a detailed plan to increase fish production. The President stated he intended to give the same emphasis to increasing fish production as he had to his successful program to increase rice production. Some observers wonder whether the government will devote enough of its scarce resources to achieve a major increase in fish production.

Production and Consumption

"Fisheries Statistics of the Philippines - 1966" disclosed that in 1966 the Philippines produced 705,278,000 kilograms of fishery products worth ₱825,988,000. In 1965, the Philippines produced 667,202,000 kilograms of fishery products worth ₱806,509,000.

Fish consumption in 1966, exclusive of fish meal, was 746,260,000 kilograms worth ₱878,442,000. Fish consumption in 1965 had

been 709,471,000 kilograms worth ₱862,393,000; per-capita consumption was 22.29 kilograms. Based on the per-capita normal requirement of 26.95 kilograms established by the National Research Food Council of the Philippines in 1959, the fish requirement in 1966 was 1,026,414,000 kilograms. Fish production was 321,136,000 kilograms (31.3 percent) short of this requirement; fish consumption was 280,154,000 kilograms short.

Imports and Exports

In 1966, the Philippines exported 2,573,250 kilograms of fishery products, including shellcraft, worth ₱4,908,357. In 1965, the value had been ₱2,775,564. This major increase resulted from export of fresh fish, mostly to the U. S. In 1966, the Philippines exported 1,063,826 kilograms of fresh fish worth ₱1,849,953, compared with 317,962 kilograms worth ₱335,099 in 1965. In 1966, the Philippines found a new export--seaweeds; ₱461,748

Philippines (Contd.):

worth were exported, mostly to the U. S. There is no prior record of seaweed export.

The export of finished shell buttons worth ₱1,129,423 was slightly below 1965's figure. The export of fresh shrimp increased slightly to ₱197,099; about 40 percent went to the U. S. In 1966, exports to the U. S., including Guam, were ₱3,531,583, about 71 percent of total exports.

Imports

Imports of fish and fishery products decreased slightly in 1966 from 1965. During 1966, the Philippines imported 50,120,327 kilograms of fish and fishery products worth ₱59,508,592. In 1965, 51,730,589 kilograms of fishery products valued at ₱61,692,012 were imported.

Canned mackerel remains the major import. During 1966, 32,019,430 kilograms worth ₱39,808,380 were imported. There was a major decrease in sardine imports in 1966: only ₱4,773,138 worth, compared with ₱15,586,768 in 1965. The National Marketing Corporation (NAMARCO) had been the major importer of sardines. In recent years, its imports exceeded the demand. This created a considerable backlog. It was one of the factors leading to President Ferdinand Marcos' decision in 1967 to end all NAMARCO imports.

Imports of sardines from the Union of South Africa dropped to ₱1,995,876 in 1966. This probably resulted from President Marcos' order of May 31, 1966, banning imports of canned fish from South Africa. The share of the Philippine market for U. S. fishery products in 1966 was about the same as 1965--₱2.3 million. Of this amount, ₱1.9 million went for cuttlefish (squid).

Inland Fisheries

In 1966, the fishpond industry produced 63,654,340 kilograms of fish worth ₱129,854,860.

	1965	1966
Area (in hectares) . 1/	137,251	138,968
Investment (in pesos) 1/	274,501,360	277,935,260
Men employed 2/	137,250	138,967
Production (in kilograms). . . .	63,197,690	63,654,340
Value of production (in pesos) .	106,172,120	129,854,860

1/Based on average developmental cost of ₱2,000 per hectare.
2/Based on average of one man employed to every hectare.

In 1966, the Fisheries Commission estimated there were still 547,340 hectares of swamplands available for fishpond use. These swamplands consisted of 186,688 hectares of fresh-water swamps and 360,650 hectares of mangrove swamps. In 1966, the production per hectare decreased slightly to 458 kilograms. This reflected again the fact that the government has made no progress in its announced plans to increase fishpond production to 2,000 kilograms per hectare. The failure to increase production may be attributed largely to lack of financing, antiquated methods of fishpond culture, lack of experienced personnel and poor management.

President Marcos also had announced plans to add 700,000 hectares to the fishpond industry. At the end of December 1967, Vice President Fernando Lopez, who was in charge of this program, complained that of the 700,000 hectares, only 3,398 hectares had been released for fishponds by the Bureau of Forestry.

Commercial Fishing

The 1966 annual production from commercial fishing operations increased only 14,825,000 kilograms over 1965. Value of the catch actually decreased by ₱5,849,000. There were 2,544 commercial fishing vessels in operation in 1966, an increase of 161 over 1965. Gross tonnage was 70,834 metric tons. In 1966, an estimated 31,026 persons were engaged in commercial fishing; 21,991 of them were licensed.

There has been no noticeable improvement in the commercial fishing industry in the past year. The industry still suffers from government neglect, lack of capital and financing, and lack of refrigeration and berthing facilities.

Fish Processing

Virtually no progress was made in the fish-processing industry during 1967. The White Rose Packing Corp. installed its fish cannery, but it was never put into operation. It was negotiating with Gulf Fisheries of Kuwait to sell the cannery for installation there.

The inability of White Rose to operate the cannery may be attributed to several factors. Firstly, it is more profitable to sell the catch as fresh fish. The demand for fresh fish exceeds supply and White Rose found it was more

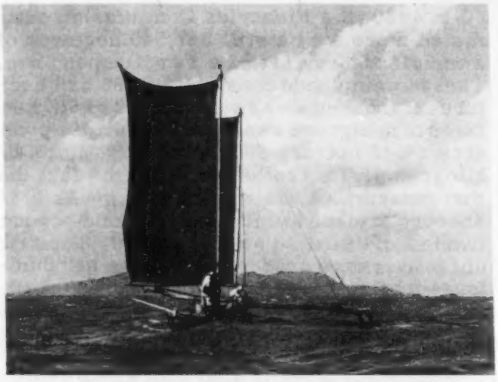


Fig. 1 - An "armadahan," 2-mast fishing boat, on Laguna de Bay.

Fig. 2 - Fisherman wears mask against sun as he uses "surambaw," a drive-in-net, in Laguna de Bay.

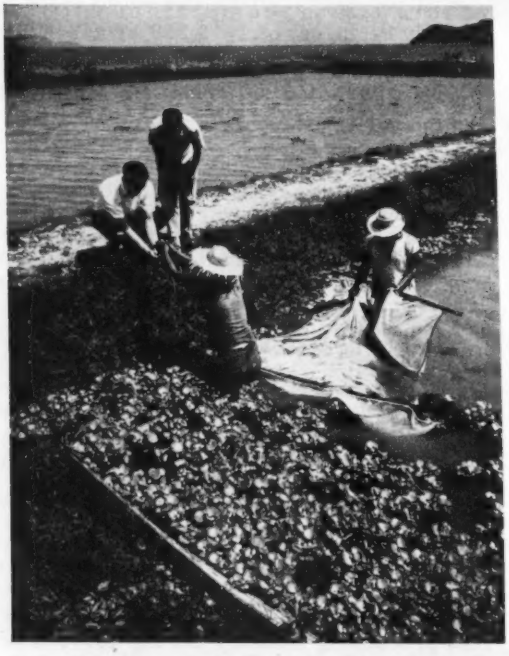


Fig. 3 - Researchers of Freshwater Fisheries Investigation Unit at Los Banos netting gobies. They seek to preserve fish and snail life of Laguna de Bay, 50 miles from Manila; also, to study aquatic insects, map lake, and check pollution.

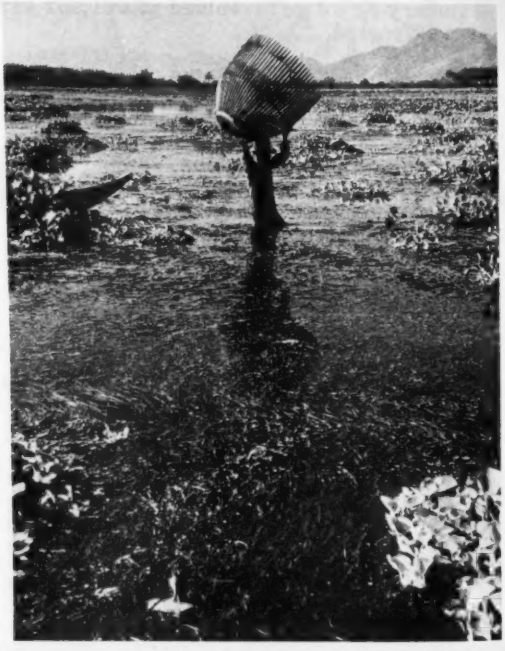


Fig. 4 - A Philippine fisherman using "Salakab." It is a bamboo cover pot designed to catch "dalag" (small fish) in inland bodies of fresh water.

FAO has helped island increase production in inland waters by determining suitable stocking species. (Photos: UN)

Philippines (Contd.):

profitable to sell its catches as fresh fish. Also, the Philippine tariff laws increased the cannery's operating cost to the point where it could not compete with imported canned fish products. The government raised the tariff on imported tinplate to 40 percent (the local product is considered unsatisfactory for canning fish) and tomato paste to 100 percent (the preferred canning sauce).

Government Activity

A proposed congressional bill to create a Fisheries Development Bank did not prosper during the 1967 congressional session. There is little likelihood that the bill will be re-introduced. The bank was to consolidate into one lending agency the power to grant loans to individuals and firms in the fishing industry. There was too much opposition from other lending agencies, such as the Development Bank of the Philippines, which were against losing these clients.

Manila Fishing Port

Construction of a much-needed fishing port at the Manila North Harbor was initiated by the Bureau of Public Works. This project is scheduled to be completed within $3\frac{1}{2}$ years at a cost of ₱22 million. It will provide 18 berths for unloading of fish catch and another 18 for servicing and bunkering. Thus far, only ₱2.9 million has been released for the project. The Government will apply for a ₱10 million loan from the Asian Development Bank; Congress will appropriate the remainder. Currently, the fishing vessels must anchor offshore and have their catch transported by amphibian truck into the major fish-landing center at Navotas, Rizal.

Outlook

A United Nations deepsea fishing expert, assigned to the nation in a joint project with the Philippine Fisheries Commission, said the Philippines could be self sufficient in fish production in 10 years. He assumed there would be improved fishing methods, better equipment, more trained personnel, and better fisheries data.

In 1968, President Marcos instructed the Fisheries Commission to prepare a detailed program to increase fish production. He said he wanted this program to be similar in scope to the successful rice production program, which resulted in a major increase in production. However, such a program would require much money, either directly by the government or through government lending agencies, for research programs and equipment, piers, refrigeration facilities, fishing boats and related equipment, and fish canneries. It is doubtful whether the nation will be able to devote enough of its scarce resource to conduct the necessary fish-production program.

Indonesia

FISHING OFFERS
PROMISE AS FOOD SOURCE

Fishing is one of the most promising parts of Indonesia's food-production situation. The Directorate General of Sea Resources estimates that in the 5.5 million square miles of adjoining seas, there is a potential annual fish harvest of 4.5 million metric tons. This figure does not include such abundant marine products as mollusks, seaweed, pearls and mother-of-pearl.

Like other sectors of production, fisheries development is hampered by shortages of capital and technical competence. Both can be supplied partly by foreign investment. However, observers say, the Indonesians themselves must provide the incentive to fisherman to produce more. Also, they must instigate the social changes required in a transition from subsistence fishing to large-scale fishing.

Marine Fisheries

In 1967, about two-thirds of Indonesia's catch of 1.25 million metric tons of fish came from sea fisheries. These fisheries are generally confined to shallow, protected waters near the coast. The fishermen cannot go farther because they do not have large, motorized seagoing vessels. The catch is reduced because these traditional grounds are slowly being depleted.

There are about 920,000 fishermen in sea fisheries. They operate an estimated 230,000 small fishing craft (hold capacity of two to ten cubic meters). Fewer than 3,500 of these are motorized. The equipment used is primitive: lines and nets are made of native natu-

Indonesia (Contd.):

ral fiber. These small fishermen account for 98 percent of the total sea catch.

Inland Fisheries

The inland fisheries include 3 different types of fishing: (1) freshwater, (2) swamp, and (3) brackish water.

East and Central Java are the centers of freshwater fish raising. Carp is the prime species. It is bred with the care that many Western cattle breeders lavish on their finest stock. Several varieties of the minnow species also are raised in inland ponds. Fish fry are available in local markets and are raised in home fishponds or flooded rice paddies. Inland fishponds produce about 80,000 tons a year.

Fisheries Production

	1967	1966	1965
	(In Thousand Metric Tons)		
Marine Fisheries	790	721	661
Inland Fisheries	465	400	370
Total	1,255	1,121	1,031

Source: Directorate General for Marine Resources.

Many varieties are caught by primitive methods in the swamp areas of Sumatra and Kalimantan. The total catch is estimated at 330,000 tons annually. The yields fluctuate greatly depending on amount and timing of rainfall.

The raising of fish and prawns in brackishwater ponds is centered in East Java. Milkfish is the principal species. An estimated 56,000 tons were produced in 1967. The ponds usually are areas reclaimed from mangrove swamps. There is heavy demand for milkfish. It is the shortage of development capital primarily that prevents reclaiming more of the over 6,000,000 hectares covered by mangrove swamps in Indonesia. Presently, the brackishwater pond area is only 140,000 hectares.

Fish Processing

Fish processing is primitive. Only about 10,000 tons of the total fish product is processed by modern canning techniques; the remainder is sun-dried, salted, or ground into meal. The latter methods are used in thousands of small operations and statistics on the total processed product are not available.

If modern equipment and techniques were introduced, there would be a real possibility of a fish surplus. So it is important that steps be taken to rehabilitate and expand the fish-processing industry. Much can be accomplished through agreements with foreign investors--concession grants stipulating that freezing plants, storage facilities, and other on-shore installations be constructed by the investor. Some effort will be needed to cultivate a domestic market for processed fish products once they become available. It is possible that modern techniques could be applied to processing popular, traditional, fish-based food, particularly meal and wafers, which would have the advantage of a ready-made market.

Fishery Problems

The shortage of capital for development purposes is the all-embracing problem. It hampers entry into deep-water fishing, prevents rehabilitation of more swamp area for brackishwater fisheries, and slows development of a fish-marketing operation.

Besides the requisites to catch fish, the industry needs better transportation, preservation, and processing sectors. Getting fish from the sea, swamp, or pond is only half the problem. The most difficult--and most neglected part--is getting the product to a local or world market in saleable condition.

Efforts to develop fishing's full potential are stymied by the fisherman's lack of training and education. The fisherman also must be provided equipment on terms he can afford (hire-purchase schemes). The fishermen reacts like the peasant farmer against attemps to introduce new techniques.

Foreign Investment

The few surveys made indicated that high-seas fisheries contain enough wealth to justify exploiting them. Most products are of great export value, considering Indonesia's perpetual foreign-exchange shortage. Particularly notable are abundant tunas (yellowfin, skipjack, and bonito) and shrimp. Shrimp also has a high value domestically.

Companies of at least 7 countries are interested in entering Indonesian high-seas fisheries. Several agreements have been signed; most are still negotiating. Two have received final government approval and are surveying.

Indonesia (Contd.):

One approved is the Shin Hung Refrigeration Co. of South Korea. It is involved in a joint shrimping venture with Nusantara Djaja Trading Co. off South Java. From the outset, Shin Hung's survey operations have met opposition from local fishing and certain military circles. Fishermen around Tjilitjap, the Shin Hung base, strongly protested alleged "theft of catch" and fouling of nets by the South Koreans. The local navy garrison insinuated that the Koreans were there only to spy on coastal defenses. These allegations have been made less frequently in recent months. This is due probably to the Maritime Ministry's demand that the Korean fleet stay at least 6 miles from the coast.

The Tjilitjap fishermen may have had some justification for the "we wuz robbed" attitude. Though cast in terms of a survey, the Korean nets were capturing over 300 tons of shrimp per month; all would have been marketable at handsome prices within Indonesia and abroad. Furthermore, a refrigerator vessel from Shin Hung is scheduled to be dispatched to Indonesian waters. In view of Indonesian emphasis on on-shore installations, the welcome for the refrigerator craft may not be cordial.

The other fleet already active is from Gulf Fisheries of Kuwait. It is operating in a joint venture with the Indonesian firm P. T. Minipaya. It is taking shrimp and lobster in the Straits of Malacca. A contract was signed Feb. 10, 1968, calling for a 10-year concession, which includes one year for survey.

A third joint venture has received government approval but has not yet been implemented. It is between A. S. Nor Kar of Norway and C. V. Bonito of Indonesia, to operate as partners off the North Central Sulawesi (Celebes) coast. It covers a 15-year period, with one year marked for surveys.

Many potential foreign investors, including Americans, have indicated interest in beginning Indonesian operations as import agents before proceeding with full-scale investment. They are interested particularly in shrimp; its price is sufficiently high to provide good profits. If profit prospects (and the political picture) indicate that investment is worth the risk, there may be a major influx of these individuals as investors in the next few years.

Japanese Investments

Many factors, including the size of Japan's 1968 aid package to Indonesia, enter into the discussion of Japanese fishing activities, or absence, in Indonesian waters. Indonesia prefers separate agreements with each Japanese company. But Japan has been pushing for a fishing treaty covering all problem areas of contention on a government-to-government basis.

Negotiations toward a fishing agreement have been proceeding since December 1967. All major points have been agreed on, though no announcement of the end of talks has been made. The inclusion or exclusion of Okinawan fishing interests in any Japan-Indonesian agreement is also a factor being discussed.

The Prospects

Production can be raised in all sectors of the industry. Technical assistance is the most important ingredient in increasing output of freshwater ponds. The Land Fisheries Institute in Bogor has expanded its extension programs to achieve this, but it is too early to assess the results.

Brackishwater fish production can be refined to an art, as on Taiwan. The money needed to reclaim more mangrove swamps will have to come from local sources because foreign investors are more interested in high-seas fishing. The prospects of the brackishwater sector are not as encouraging as other areas. Many existing ponds near Surabaya have been neglected. In some cases, sluice gates that control flooding have fallen into disrepair; the ponds themselves have become filled with silt.

Prospects for the swamp fisheries sector, to a great extent, are unknown. Presumably, the swamp areas would be harvested more intensively if the fisherman could sell a larger catch. At the same time, there would probably be a greater demand for swamp fish--if there were adequate means to transport the catch from remote swamp areas to urban markets and to store it.

Because it is attractive to the foreign investor, the marine (high seas) sector holds the greatest promise.

Malaysia

FISHING INDUSTRY PRODUCES 70-80% OF ANIMAL PROTEIN

The marine fishing industry is not one of the most significant sectors of the nation's economy, but it provides 70-80% of the animal protein consumed. The fishing industry has grown at a 7.5% rate during 1960-1965 and will continue to grow during the coming decade. Of total fish production, the marine fishing industry accounts for about 90%. For the First Malaysia Plan (FMP), the government has allocated during 1966-70 US$7.4 million for training, research, installations and equipment to develop both fresh-water and marine fisheries.

In 1965, the first Malaysian fishing boats entered deep-sea fishing in the Indian Ocean. Industry leaders, traditionally oriented to areas within 50 miles of the Malaysian coast, are exploring the possibilities of expansion into deeper waters. Most crew members of the few deep-sea boats are Japanese because no Malaysians have been trained. The FMP calls for establishment of a Fisheries College to meet this need.

The Department of Fisheries in the Ministry of Agriculture and Cooperatives directs all marine science activities.

The Industry

The retail value of marine fish landings in 1965 was 2.2% of the gross national product (GNP); exports of fish and fish preparations were 1.1% of total 1965 exports.

68,000 Fishermen

Department of Fisheries statistics for 1965 show that the marine fishing industry in the states of Malaysia employs 68,000 fishermen. The industry operate about 22,520 boats and 18,000 licensed gear of about 70 types. The gear range from highly capitalized purse seines 250-300 fathoms long to primitive handlines, from giant fishing stakes (capitalized at US$5,000-6,667 each) to small conical nets set in tidal runs and held in place by 2 poles fixed to the sea bed.

Of the 22,520 boats, about 12,300 are mechanized: 8,400 with diesel engines from 4 h.p. to over 200 h.p., and 3,900 with outboards. They fish not more than 50 miles from the coast. In 1965, they landed 198,400 tons of fish worth US$58 million. Fishermen landed about 235,000 tons of fish in 1966, up 18 percent over 1965. This unexpected change is attributed almost entirely to the end of area tensions and the increasing importance of trawling.

In Sabah and Sarawak, the 1960 population census reported 6,000 and 5,500 fishermen, respectively. Sabah's landings in 1965 were estimated at 25,400 tons worth US$6 million. No figures are available for Sarawak, but a conservative estimate is 6,000 tons annually.

Fig. 1 - In Penang, many privately owned, well-equipped boats fish on large scale. Fishermen aboard are paid on daily or share-of-catch basis. (Photos: FAO/S. Bunnag)

Fig. 2 - Penang fishermen put to sea in late afternoon. They use lighted oil lamp to attract fish at night.

Malaysia (Contd.):

Fish Used At Home

The bulk of the fish is marketed without dressing and consumed locally. Ice may be used, but its high price in many places and some consumer resistance adversely affect its use. Salting and sun-drying the salted fish is the most common form of processing. During 1961-1965, fish processing advanced, largely for export. Frozen tuna and fish meal were produced in Penang, frozen fish in Perak, and frozen prawns in Sabah.

Fig. 3 - Shrimps drying under Penang sun, one way to preserve them. They bring good price because, when mixed with food, they add as much flavor as fresh shrimps.

During the past few years, the fishing industry has been one of the faster-growing industries. Its annual growth rate during 1960-1965 was 7.5%, while the aggregate production index of other commodities was 4.8%.

The expansion resulted from the mechanization of fishing boats, widespread use of nets made of synthetic fiber, and improved fishing techniques.

The value of fish and fish preparations exported climbed from US$6.3 million in 1960 to US$12.3 million in 1965. About 70% of these exports were fresh, chilled, and frozen marine fish. While Singapore has remained the major destination, growing markets have been created in the U. S., Japan, and Thailand.

During the same period, Malaysian imports of fish and fish preparations remained at about US$10 million per year. Fresh, chilled, and frozen marine fish; canned fish preparations; and salted, dry, or boiled molluscs account for nearly three-fourths of total imports. The major sources of fish imports have been Japan, Thailand, Singapore, and Indonesia.

During the First Malaysia Plan (FMP), 1966 to 1970, the annual fish catch is predicted to grow at a 6% rate. FMP's fisheries program is aimed at expanding research; training fishermen to be more competent; encouraging them to use improved equipment, gear, and other facilities; helping producers to improve processing and marketing methods; and establishing the facilities for large-scale and efficient marine fishing. The program amounts to US$5.7 million in Malaya, US$.4 million in Sabah, and US$1.3 million in Sarawak.

Marine Sciences

The Director of Fisheries, M. K. Soong, sees the underdeveloped state of fishing science as a major impediment to industry growth. A limited amount of quality research is being conducted by 7 research officers in the Department of Fisheries and at the Fisheries Research Institute under the Department. Both marine and fresh-water topics are studied. These researchers must confine themselves to compact problems--such as the biology of the cockle and early stages of the mangrove crab, rather than larger investigations requiring team work.

Fisheries science at the university and college level has not received the attention that agricultural science has. Graduates of the University of Malaya and the technical colleges--none offers diploma courses in marine sciences--do not have the desired background for fisheries administrative and research work. In May 1964, a postgraduate diploma course in fisheries was instituted by the Fisheries Biology Unit, Department of Zoology, University of Singapore. Two Malaysians have completed this course and are now working with the Department of Fisheries. About 12 other Malaysians are taking advanced courses required for fisheries development outside of Malaysia, mostly in Japan and Canada.

Malaysia (Contd.):

2 Marine Fisheries Schools

Under the first and second 5-year development plans, 2 marine fisheries schools were completed, one in Penang on the West Coast and the other in Kuala Trengganu on the East Coast. These schools train inshore fishermen in simple navigation, engine maintenance and repairs, and in fishing methods. The Penang school has been offering two 5-month courses per year and training about 60 fishermen annually. It was scheduled to offer a full year's course to about 30 fishermen. The Trengganu school runs three 3-month courses and takes in 90 trainees a year. The trainees receive an allowance from the Government to support their families while they study.

The Department of Fisheries initiated the planning of a Fisheries College for Penang modelled after Japanese and Canadian institutions. The development of modern, deep-sea, and oceanic fishing requires men trained in the technology and management of fishing enterprises. They are not available today because the 2 existing schools cater exclusively to inshore fishermen. The proposed college will provide 3-year training in navigation, fishing technology, marine engineering and electronics, fisheries economics and management, and fisheries products and refrigeration. A diploma in fisheries will be awarded at the end of the course. Local staff for the college are being trained overseas. The State Government of Penang has donated 87 acres. The college will have a hostel for 200 students. The total student enrollment will be 300.

In addition to the Fisheries College in Penang, the FMP calls for a fisheries training center in Sabah, and possibly a second fisheries center in Sarawak. To supplement the activities of these schools, fisheries mobile units will be set up. These units will visit fishing villages throughout the country to demonstrate the use of proper gear and equipment--and disseminate information on maintenance and repair of engines.

International Cooperation

Malaysia has not participated in many international cooperative ventures in marine science. In May 1967, the Malaysian Minister of Agriculture and Cooperatives, Mohammad Ghazali bin Jawl, returned from Thailand. He announced that the two governments had agreed to survey the fishing resources off their coasts. The project began in February 1968 and lasted 6 weeks. The two governments are examining the density of ground fish and the variations in density with water depth. A similar joint study also is scheduled to be conducted in 1968 off the northern coast of Eastern Malaysia.

Japanese Investments

The Japanese have undertaken the major joint business ventures with the Malaysians in marine exploitation. The Malaysian-Japanese fishing company in Penang, Malayan Marine Industries, Ltd., produces about 800 short tons of frozen tuna and 500 cartons of canned tuna in brine each month. The tuna is produced for export. The U. S. is the principal market. Although the company was established in 1959, it relied entirely until 1965 on Japanese tuna catches. In 1965, Malayan Marine Industries sent the first Malaysian-flag boats into the western section of the Indian Ocean. The company has decided to add an eighth boat to its fleet. All but one, however, carry only Japanese crew members because there are no qualified Malaysians. The one training ship with Malaysians ventures only to intermediate distances in the Indian Ocean.

The Japanese have invested $100,000 in the North Borneo Fishing Co., Ltd., a joint venture in which Malaysians hold 52% of the stock. This company fishes for prawns in the coastal waters off Sabah, exporting most to Japan. Most workers are citizens of Japan or Hong Kong. The Japanese wholly own a second prawn fishing company, Tropical Seafoods Ltd., in Sarawak. Their investment was $78,000.

Both Taiwan and Korea have shown interest in basing larger parts of their deep-sea fishing operations in Penang. One Taiwanese company has formed a subsidiary, and the Koreans are considering a joint venture.

Foreign Help

Canada, France, Germany, and Japan have shown interest in helping to develop the fishing industry. The Canadians completed a feasibility study of the Kuala Kedah fishing port and are considering methods of financing it. A French team visited Penang to study development of the fishing harbor.

Malaysia (Contd.):

The Germans have also been approached for a feasibility study of a fishing port at Lumut.

The Malaysians have asked Japan for assistance. On Nov. 22, 1966, the Japanese and Malaysians signed a loan agreement of US$50 million to finance development projects.

At the Southeast Asia Agricultural Development Meeting in Tokyo, in December 1966, Japan agreed to organize a group of experts to study the problems of establishing a research center for marine fisheries.

Fishing Conflicts

Since few Malaysian fishermen travel farther than 50 miles from the coast, there are few fishing conflicts with other countries. Hostilities between Indonesia and Malaysia from 1963 until 1965 restrained Malaysian fishing, especially in the rich coastal waters off eastern Sumatra. With confrontation over, Malaysian fishermen are venturing into the Straits of Malacca. Malaysian fish merchants are renewing contracts with Sumatran fishermen and fish dealers. Indonesian piracy poses a continuing problem in the Straits. Reports of incidents appear almost weekly in Malaysian newspapers.

Occasional trouble has arisen with Thai trawlers in recent months. The Thais have more experience with trawling than the Malaysians. The Thais have begun to outgrow their nation's limited inshore fishing grounds and are gradually moving into waters off Malaysia's northwest coast. Although questions of fishing rights hold potential problems, both countries would prevent serious incidents.

Indian Ocean Fishing A Possibility

The focus of expansion for the Malaysian fishing industry is the Indian Ocean, dominated almost exclusively by Japanese deep-sea fishermen. Only one Malaysian fishing company, Malayan Marine, partially owned and almost totally operated by the Japanese, is engaged in deep-sea fishing there. A second company in Prai, owned by a Malaysian, is studying opportunities in Indian Ocean fishing.

Pakistan

HOW SHRIMP ARE INSPECTED

Pakistan's shrimp industry consists of about 250 privately owned fishing vessels. In most cases, these are owned by their operators, although a few owners may have up to 6 vessels.

Fishing is traditional. The catch is stored aboard vessels in wicker baskets with chipped ice to avoid spoilage. These boats may remain out as much as 5 or 6 days, depending on how long it takes to catch a load. Once loaded, the boat returns to the Fish Harbor. There, one of 20 processing companies buys the catch at auction. The processing plants reject an average 20 percent of each boatload due to crushing and spoilage.

Handling Shrimp

Shrimp are received in the baskets used on boats. They are poured out in heaps on a cement floor. Workmen discard the spoiled or damaged ones, dehead the remainder, and place them in fresh water for washing and cleaning. Then the shrimp are ready for the next step. They are sorted according to size and divided up further, part frozen in the shell, but the greater part removed from the shell.

Shrimp and prawn business at 9-year-old Karachi market is good. Boys and men handle catch. When sold, it is hurried to one of processing factories built nearby. Most of these crustaceans are packed, frozen, and exported to N. America and Europe. (FAO/J. Olsen)

Once removed from the shell, the shrimp tails are again graded by size and quality; some are put into boxes and frozen in blocks. The best quality pieces are placed on trays, so that the pieces do not touch, and are individually quick frozen. These are packaged in cellophane or plastic bags.

Japan

3 MORE TRAWLERS TO FISH IN ICNAF AREA

The Japanese Fisheries agency will license 3 stern trawlers to fish north of 40° N., where a government-chartered stern trawler has been "exploring off Newfoundland." The vessels will be required to observe ICNAF mesh regulations. Six firms have asked to be licensed.

It is not known now whether the Fisheries Agency will grant 3 more licenses. Of the 8 to 9 trawlers licensed to fish south of 40° N., only 2 were reported there. All of the trawlers had been operating off Africa's north coast in the eastern Atlantic.

* * *

LONG LINERS REPORT GEAR DESTRUCTION BY PURSE SEINERS OFF MEXICO

Japanese tuna long-liners operating on the high seas off the Mexican coast report frequent gear damage and losses caused by purse seiners of other countries. Long lines have been cut, and glass floats and radio buoys destroyed. This seriously hinders operations.

The Federation of Japan Tuna Fishermen's Cooperative Associations claims such interferences will make it difficult to attain its tuna catch quota established under the Japan-Mexico Fisheries Agreement. The agreement became effective on June 10, 1968. The Federation plans to urge the Japanese Government to protest to the countries involved--and to send a guidance vessel to the area to protect the Japanese vessels. ("Katsuo-maguro Tsushin," June 14.)

* * *

SALES OF CANNED TUNA IN BRINE SLOW

The Japan Export Canned Tuna Packers Assoc. at a late May meeting agreed that measures must be developed to overcome slow sales of canned tuna in brine to the U. S. The canned tuna in brine inventory was around 1 million cases at the packers' level. At the rate of sales then, exports would fail to attain the 1968 export target--and could even fall far below 1967 shipments to the U. S.

Trading Firms & Packers Differ

The trading firms explained that export prices were around 80 cents per case too high. Unless the packers reduced their prices, it would be difficult to sell the product to the U. S. The packers, on the other hand, hoped to raise prices. They claimed they were paying US$454-504 a short ton for the raw material and losing money selling their packs at the prevailing price.

As a possible solution to the high cost of raw material, the idea of buying tuna from South Korean and Taiwanese fishermen was discussed. The trading firms, however, indicated that negotiations for lower prices would be difficult so long as high prices prevailed in Japan. ("Katsuo-maguro Tsushin," May 28.)

* * *

FILM ALBACORE FEEDING BEHAVIOR

Tokai University's new oceanographic vessel, "Tokai Daigaku Maru Nisei," has succeeded in producing the world's first underwater video-tape recording of albacore tuna feeding behavior. The 702-gross-ton craft, built in Jan. 1968, used a specially designed television camera.

The recording was made on May 16, 1968, during the vessel's research cruise to the albacore grounds 25 miles north of Minami Torishima Island (south of Tokyo Bay).

How It Was Done

On that day, when a dense school of albacore was located, the TV was lowered from the side several meters. Pictures were taken for about 20 minutes during pole fishing. The camera obtained an unobstructed view of feeding behavior and hooking condition within a radius of 23-26 feet.

Film Will Be Studied

The University will closely examine each picture frame to study the speed of fish when they strike the bait, density of school, effects of water spray on biting condition, and other characteristics. This should provide more knowledge about albacore feeding behavior. ("Suisan Keizai Shimbun," May 28.)

日本

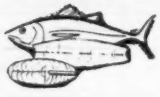
Mauritius

MOST JUNE TUNA PRICES STEADY

The Japanese Overseas Fisheries Co., Penang, Malaysia, which operates the tuna base at Port Louis, Mauritius, in the western Indian Ocean, announced it would pay these prices for tuna delivered to Port Louis in June.

Species	Exvessel Price 1968		
	June	May	April
	(US$/Short Ton)		
Albacore, round:			
Large--over 24 pounds	371	353	365
Small, under " "	252	257	257
Yellowfin, gilled & gutted:			
Extra large, large, medium	315	-	-
Small	176	-	-
All sizes	-	302	302
Fillets--over 26 pounds	290	290	290
Big-eyed, gilled & gutted:			
Over 66 pounds	202	202	202
Fillets--over 26 pounds	315	315	315
Bluefin, gilled & gutted:			
Over 66 pounds	202	202	202
Fillets--over 26 pounds	-	264	264

Source: "Katsuo-maguro Tsushin," May 31.



Thailand

DELEGATION VISITS NORWAY
TO STUDY FISHERY TECHNOLOGY

A Thai delegation representing major segments of the fishing industry visited Norway, March 25-April 7, to study fishery technology. The delegation leader and interpreter was M. L. Prachaksilp Tongyai, of the Marine Fisheries Laboratory, assigned by the Director General of the Department of Fisheries, Prida Karnasut.

Mr. Prachaksilp Tongyai reported to Commercial Fisheries Review:

"The fishing industry in Thailand has in recent years become progressively more mechanized. The landings from trawlers and purse seiners have steadily increased, but the fluctuations in fish prices have kept the fishermen from investing in enterprise-type fisheries.

"Fishermen and fisheries promoters, therefore, sought the aid of the Thai Department of Fisheries and the Norwegian Government. Aid was granted for 5 fisheries representatives and one Fisheries Department official to visit Norway. . ."

Norwegian Hospitality

Through the Export Council of Norway, the delegates were hosted by Norwegian companies and Scandinavian Airlines. "The delegates were able to acquaint themselves with the advanced fishery technology of Norway and begin business contacts which would help them to help themselves towards more efficient and economical utilization of fisheries resources of Thailand."

* * *

RATIFIES 1958
LAW OF THE SEA CONVENTIONS

On May 23, the Thai National Assembly ratified the 4 Conventions on the Law of the Sea adopted at the 1958 Geneva Conference. Thailand's official gazette published the ratification the same day. The last step required--depositing the ratification with the United Nations--was expected to take place soon.

Thailand claims a 12-mile territorial sea, proclaimed unilaterally in October 1966. (U. S. Embassy, Bangkok, May 28.)

Taiwan

FISHES FOR TUNA ROUND THE WORLD

The Taiwanese deep-sea tuna fleet numbers about 280 vessels; 90 of these were added during 1967. In mid-1968, about 50 vessels were fishing from Abidjan and Monrovia, 70 from Port Louis (Mauritius), 30 from Penang (Malaysia), 100 from American Samoa, 20 from Fiji Islands and vicinity, and 10-15 from St. Martin in Leeward Islands (Caribbean). The fleet shifts areas occasionally depending on tuna abundance and other factors.

1967 Landings

In 1967, Taiwanese tuna fleets landed about 80,000 metric tons of fish--half from deep-sea fisheries. Production plans for the end of the 5-Year Plan (1972) provide for doubling the annual tuna production to about 200,000 tons and exporting much of it.

Taiwan (Contd.):

70-80 Vessels in 1968

In 1968, the Taiwanese have scheduled to build 70-80 more tuna vessels. Of these, 50-60 are to be built in domestic, and about 20 in foreign, shipyards. Foreign-built vessels of about 250 gross tons each will be financed by a World Bank Loan (US$7.8 million authorized several years ago). Domestically built tuna vessels will be 150-200 gross tons each.

* * *

PLAN TRANSFER OF TUNA VESSELS FROM AMERICAN SAMOA

The Taiwanese tuna fishery operators based in American Samoa have vessels which, in 1967, accounted for over 35 percent of tuna landings. They plan to transfer their large refrigerated vessels to other oceans because the South Pacific catch is declining.

The Samoa-based Taiwanese fleet is about 70 vessels, about 50 equipped with refrigeration. The Taiwanese hope to use their large, 200-gross-ton, vessels in the Indian and Atlantic oceans.

Good Seasonal Fishing

There, the seasonal fishing for yellowfin and albacore is good. They expect no difficulty in finding suitable bases for their operation. This is because in the Indian Ocean the Japanese Overseas Fisheries Co. operates a large tuna base at Port Louis, Mauritius; in other areas, the Japanese trading firms are actively seeking to contract Taiwanese vessels to fish for them.

The China Marine Trading Co. also will represent Taiwanese vessels that will land fish at Port Louis and at Tema, Ghana. ("Suisan Tsushin," May 24.)

TONGUE OF THE OCEAN

The Tongue of the Ocean, a 160-kilometer-long, 3,600-meter-deep undersea canyon in the Bahamas, has been a deep-water feature for at least 13 million years, probably longer.

The limestone that forms the rugged outcrops in the canyon walls was not made from the sediments that presently are accumulating in the area, according to a report by two U. S. Geological Survey scientists.

Comparison of data from test wells on nearby Andros Island with the depths of the rock formations in the Tongue of the Ocean suggests that the strata have either slid downslope into the canyon or been down-warped in that area.

Conditions similar to the present have prevailed since the late Miocene epoch when the rock was apparently formed under 300 meters or more of seawater, according to Survey scientists Thomas G. Gibson and John Schlee.

"We do not know how the outcrops formed, but suggest slumping on the side of the canyon as a possible explanation."

The team studied the giant submarine canyon from the research submarine "Alvin" in August 1966. They made two dives approximately five kilometers southwest of New Providence Island ranging in depth to 1,676 meters. (Reprinted, with permission from "Science News," weekly summary of current science, copyright 1966, by Science Service, Inc.).

SOUTH PACIFIC

Australia

IMPORTS OF FISH OILS DROP

Australian imports of marine animal and fish oils dropped considerably in FY 1966/67 (July 1, 1966, to June 30, 1967), compared with imports in FY 1965/66. Exports also were down. (Agricultural Attaché, U. S. Embassy, Canberra, May 24, from Commonwealth Bureau of Census and Statistics.)

	Imports	
	FY 1966/67	FY 1965/66
	. . .(Imperial Gallons) . . .	
Marine Animal and Fish Oils:		
Whale oil	747,068	1,718,352
Cod-liver oil, incl. refined	92,591	107,495
Seal and fish oils, unrefined	60,563	82,094
Other marine animal oils	7,136	14,626
Processed Oils (Boiled, oxidized, dehydrated, blown, or polymerized):		
Cod-liver oil	Not available	20
Whale oil	102,112	59,472
Other marine animal and fish oils	7,686	12,021
	Exports	
Whale oil	932,934	1,287,603
Other marine animal and fish oils	471	1,828

New Guinea

JAPANESE-AUSTRALIAN SHRIMP VENTURE RUNS SMOOTHLY

The South Sea Fishing Co., a joint Japanese-Australian shrimp fishing venture established in Port Moresby, New Guinea, in early 1967, is operating smoothly and profitably. The company operates one 350-ton freezership converted from a tuna vessel--and 5 shrimp vessels that trawl off the southern coast of New Guinea.

Principal catches are tiger shrimp, averaging heads off 20 a pound, the size very easy to sell in Japan. ("Suisan Tsushin," April 30.)

New Zealand

BROADENS FISHING INDUSTRY SUBSIDIES

New Zealand has joined the ranks of nations increasing subsidies to their fishing fleets. She has broadened her subsidies to provide for purchase of new and used vessels, new engines for replacement, gear and equipment, mortgage guaranties, loans, and refinancing of loans.

BCF Holds Fishery Workshop on Okinawa

Three scientists from BCF's Biological Laboratory in Honolulu held a fishery workshop for researchers on Okinawa in May at the invitation of the government of Ryukyu Islands. The 3 were Richard S. Shomura, Deputy Area Director, and Tamio Otsu and Brian J. Rothschild, fishery biologists.

The workshop was held for scientists of the government's Fishery Division and the University of the Ryukyus.

The Ryukyus

Okinawa is the most important of the 73 Ryukyu Islands lying between Japan and Taiwan. Nearly 90 percent of the million Ryukyuans live in Okinawa. Agricultural land is scarce and the islands are seeking ways to strengthen their fisheries.

The Honolulu scientists are interested primarily in skipjack tuna (aku) because it is the principal Hawaiian fishery. Okinawan catches are 8 million pounds; the Hawaiian average is 10 million. However, there are many more vessels and fishermen in Okinawa.

How Skipjack Is Processed

On Okinawa, most of the skipjack tuna catch is smoke-dried and made into "katsuobushi" (skipjack sticks). Most of the Hawaiian product is canned. Both fisheries are seasonal and peak in midsummer.

Fishery Techniques Similar

The fishing techniques are similar. In Okinawa, and in Japan, the skipjack are attracted to the ship by live bait and are caught with pole and line. In Okinawa, bait is relatively scarce.

Workshop Aboard Ship

The BCF scientists met with fishermen and inspected fishing operations. In the workshop, they discussed the methods used to study skipjack in their Honolulu lab.

They spent several days at sea demonstrating method of tagging skipjack. The purposes are to study migrations and other aspects of the skipjack life history.

As a result of the workshop, scientists of Okinawa's Fisheries Research Institute have promised to conduct a comprehensive tagging program this year.

PROPER PRECAUTIONS TO KEEP FISH FRESH FOR TABLE

Certain steps are in order if the fisherman wants his catch to reach the dinner table in the best possible condition, says Henrietta Gossett, home economist in the Seafood Marketing Division of the Texas Parks and Wildlife Department.

According to Miss Gossett, a few simple steps will retain freshness and help identify good quality fish.

The fish should be cleaned as soon as possible after it is landed with all of the internal organs removed. An alternative to this is to keep the fish alive in bait wells or on a stringer.

Since fish decomposes rapidly, it should be refrigerated as soon as possible. The lower the temperature, the slower the rate of spoilage, so ice would be a good investment to protect the catch.

Miss Gossett says that bruising and crushing hasten spoilage, so fish should be handled as little as possible.

To assure selection of fresh fish, she suggests that a few qualities be observed:

Fresh fish have full and transparent eyes. Sunken eyes are a sure sign of bad fish. Shiny skin is another clue to good fish. Gills on fresh fish are bright red or pink and become progressively duller as the fish spoils. Firm, elastic flesh which clings to the bone is another sign the fish is fresh.

Fish should have only a mild odor. If the fish has a strong, putrid odor, it should not be eaten.

Here are a few other hints which will heighten the enjoyment of fish:

Fresh fish should be rinsed in cold water and drained on absorbent paper. If the fish is to be cooked within the next 24 to 36 hours, it should be placed in a covered bowl or in plastic wrapping in the coldest part of the refrigerator. If the fish is to be kept for any time longer than 24 to 36 hours, it should be rinsed, drained, and wrapped tightly in moistureproof, vaporproof paper and placed in the freezer.

By following these procedures, the fish will retain a maximal moisture level, and the odor of the fish will not be transferred to other foods in the refrigerator.

Fish should not be frozen in wax paper, parchment paper, or polyethylene materials, which are not moistureproof and vaporproof.

When fish thaws, it should be cooked immediately and never refrozen. Frozen fish should be thawed in the refrigerator at 37° to 40° F. The fish should be held at this temperature only long enough to permit ease of preparation. It takes about 24 hours to thaw a one-pound package in this manner.

If a quicker method is necessary, the fish, still wrapped in the moistureproof, vaporproof wrapping, may be held under cold running water. One to two hours should be allowed for thawing a one-pound package by running water over it. (Reprinted from Texas Parks and Wildlife Department "News.")

AFRICA

1968 FISH CATCH UP IN SOUTH AND SW AFRICA

South Africa's Cape west coast shoal fish catch for the first 2 months of the 1968 season, excluding both factory ships, was 67,224 short tons of pilchards, 867 of maasbanker, 23,410 of mackerel, 20,370 of anchovy, and 1,815 of red-eye herring. The total: 113,677 tons.

In the 1967 period, the catch was 110,319 tons: pilchards 48,551 tons; maasbanker 3,216; mackerel 9,526; anchovy 57,341; and red-eye herring 1,685 tons. In 1966, the Jan.-Feb. total was 54,928 tons: pilchards 20,772 tons; maasbanker 8,248; mackerel 9,400; anchovy 12,987; and red-eye herring 3,521 tons.

January 1968 Figures

The Division of Sea Fisheries reported the Jan. 1968 catch comprised pilchards 23,896 tons; maasbanker 696; mackerel 21,923; anchovy 10,810; and red-eye herring 836 tons. The total catch was 58,161 tons. In Feb., the total catch was 55,516 tons: pilchards 43,328 tons; maasbanker 171 tons; mackerel 1,478; anchovy 9,560; and red-eye herring 1,815 tons.

In Feb. 1967 the figures were: pilchards 34,763 tons; maasbanker 1,579; mackerel 8,957; anchovy 23,814; and red-eye herring 1,685 tons. In Feb. 1966: pilchards 16,135 tons; maasbanker 1,889; mackerel 6,062; anchovy 6,034; and red-eye herring 3,521 tons.

The Jan. 1968 catch yielded 13,467 tons of fish meal, 543,252 gallons of fish body oil and 1,852,512 lbs. of canned mackerel. In Feb. 1968, the catch yielded 13,664 tons of fish meal, 289,118 imperial gallons of fish body oil, and 101,136 lbs. of canned mackerel.

South-West Africa

In South-West Africa, the Jan. 1968 shoal catch was 14,862 tons of pilchards and 72 tons of anchovy; these yielded 3,872 short tons of fish meal and 1,298 long tons of fish body oil. The Feb. catch reached 69,170 tons of pilchards, 3,575 tons of anchovy, and 54 tons of maasbanker; the catch yielded 16,766 tons of fish meal and 5,240 tons of fish body oil.

Pilchard boats were making good catches both north and south of Walvis Bay in March. The oil yield was still high, averaging around 23 imperial gallons per ton of fish.

However, the snoek fishing had deteriorated. Only a few Cape Town boats were reported operating. ("The South African Shipping News and Fishing Industry Review," April.)

South Africa

FACTORYSHIP HAS GOOD TRIP

The 31,000-ton South African fish factoryship "Willem Barendsz" arrived in Cape Town, South Africa, in early June with a processed fish catch worth about US$1.6 million. The catch already had been sold to European buyers. This is the vessel's best earnings in about 18 months as the country's first fish factoryship.

Large Catch

In 6 weeks, the ship's 10 seiners caught about 52,000 metric tons of pilchards. These were processed by the factoryship into 12,500 metric tons of fish meal and 3,600 long tons of fish oil.

The ship steamed as far as 1,000 miles from Cape Town to find the fish. ("South Africa Digest," June 7.)

MID EAST

Iran

SHRIMP INDUSTRY

The Iranian Government has turned over shrimp catching, freezing, and exporting rights to 2 private firms. The frozen shrimp are delivered from factoryship to refrigerated cargo ships for transport to the U. S. Quality controls and sanitation are reported by the Iranians to be equal or better than those of U. S. producers in the Gulf of Mexico. Ships have U. S. processing supervisors aboard who have worked in the Gulf of Mexico.

2 Concessionaires

Concession rights to catch, freeze, and export shrimp are granted by the government-owned Southern Fisheries Co. (SFC). Only 2 companies are using their concessions: Gulf Fisheries Co., a Kuwaiti firm, and Ross Persian Seafoods Corp., a British-Iranian venture. Gulf catches about 2,000 metric tons of shrimp a year, twice Ross' catch. The U. S. and Japan are the largest consumers.

The Operation

Ross Persian has fifteen 80-foot trawlers and 2 factoryships, 4,000 and 2,000 net tons. The trawlers deliver the catch to the factoryships, where the shrimp are processed, graded, and frozen into 5-kilogram (11-pound) packages. Periodically, the packages are transferred directly from factoryship to cargo vessels of the Concordia Line for delivery to the U. S.

The frozen shrimp for export are never landed in Iran. The shrimp are cleaned and the heads removed before freezing; the shrimp are not deveined until they reach the U. S. for further processing.

The processing and sorting machinery is U. S. made. Nearly one-fourth the personnel processing shrimp are U. S. or European nationals.

Gulf Fisheries operates similarly, although it has 30 trawlers and production is proportionately higher.

Inspection

Dr. Amin Keyvanfar, a marine biologist, supervises sanitation and quality controls over shrimp harvest in the Persian Gulf's Iranian waters. He works for the government-owned Southern Fisheries.

According to Dr. Keyvanfar, the shrimp are caught, separated from rest of catch, decapitated, and washed with sea water. Then they are placed in 5-pound cans (with one pound of sea water added), frozen on ship at -35° C. (-31° F.) and stored at -25° C. (-13° F.). The catches are transferred to motor ships at least weekly and are transferred again to cargo ships at least monthly.

Dr. Keyvanfar visits trawlers and mothership at random to insure maintenance of sanitation.

No precautions are taken or preservatives used to prevent enzyme spoilage. (U. S. Embassy, Tehran, Mar. 6, Apr. 20.)

United Arab Republic

FISHERY DEVELOPMENTS

Three of the 8 new refrigerator trawlers ordered by the United Arab Republic (UAR) from Spain were delivered and now are fishing together off West Africa.

The vessels, about 140 feet long, reportedly have a nonstop range of 15,000 miles and a refrigerated hold capacity of 850 tons. Another 14 modern trawlers are scheduled to be built at the Alexandria shipyards to complete the planned UAR high-seas fishing fleet.

Sponge Fishers

UAR sponge fishers harvested 500,000 pieces off the country's Mediterranean coast last season. Until 2 years ago, the area was fished under a concession agreement with Greek entrepreneurs.

High Dam Cuts Catch

Though complete figures are not available, indications are that the catch from the Nile Delta lake and offshore areas--normally about half the UAR's fish catch--has fallen noticeably in the last 2 years. This resulted from the operation of the High Dam. In holding back the Nile flood, the dam also held back much food in the flood waters. Apparently, the UAR's sardine catch has been particularly affected. (U. S. Embassy, Cairo, June 11.)

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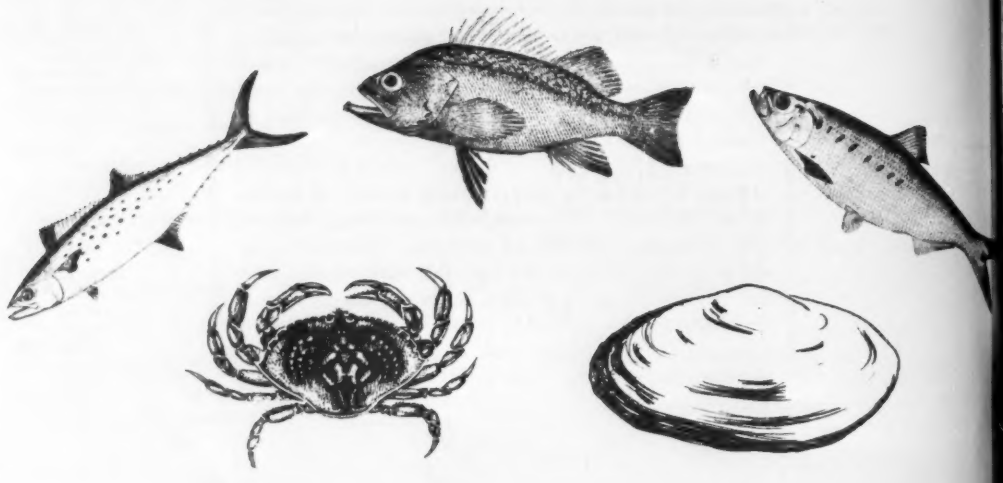
Created in 1849, the Department of the Interior—America's Department of Natural Resources—is concerned with the management, conservation, and development of the Nation's water, fish, wildlife, mineral, forest, and park and recreational resources. It also has major responsibilities for Indian and Territorial affairs.

As the Nation's principal conservation agency, the Department works to assure that nonrenewable resources are developed and used wisely, that park and recreational resources are conserved for the future, and that renewable resources make their full contribution to the progress, prosperity, and security of the United States—now and in the future.

UNITED STATES DEPARTMENT OF THE INTERIOR
U.S. FISH AND WILDLIFE SERVICE
BUREAU OF COMMERCIAL FISHERIES

Development of Underutilized Fishery Products



The Bureau of Commercial Fisheries works with the domestic fishing industry to develop markets for presently underutilized fishery products. The Bureau's recent accomplishments include markets developed for Spanish mackerel, mullet, Northern shrimp, ocean quahogs, soft shell clams, and Pacific Coast groundfish.

These products are being introduced to chain restaurants, cafeterias, and retail food chains. As a result of Bureau efforts, several of these outlets are now merchandising underutilized products.